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Memoirs
OF THE
British Astronomical Association.

EDITED BY
A. S. D. RUSSELL.

REPORTS
OF THE
OBSERVING SECTIONS.

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SECTION FOR THE OBSERVATION OF METEORS.

DIRECTOR.—HENRY CORDER.

REPORT OF THE SECTION.

Meteor Showers, 1894.

QUADRANTIDS OF JANUARY 1-3.

This shower was not well observed, as the weather was not very favourable, and meteors seemed scarce.

At Bristol, Mr. Denning saw in all about a dozen meteors on January 1 and 2, but none of them appeared to be Quadrantids, although the watches extended over about three hours altogether.

Mr. Milligan, at Belfast, was watching for a short time on January 2, and saw two bright meteors in the northern sky, and then clouds came on.

At Bridgwater the Director was out at intervals during the night of January 1, about $3\frac{1}{2}$ hours altogether, and registered 19 meteors, of which only seven were Quadrantids.

Between $6^h 55^m$ and $7^h 35^m$, January 2, the hourly number was very high for a short spurt, and several Quadrantids and Herculids were seen. After this the number dropped to four or five an hour, and rose again to eight between 11^h and 12^h . The Herculids, with a radiant at $240^\circ + 48^\circ$, were more interesting meteors generally, having faint red streaks, and bluish heads, while the Quadrantids were rather quicker but not often leaving streaks. Their radiant appeared to be at $219^\circ + 53^\circ$. There was an interesting shower of slow orange meteors with a radiant about 1° above β Tauri, and other feeble showers in Gemini, Lynx, &c.

Mr. Backhouse sends the following table, showing the results of his watch at Sunderland. He only saw one meteor as bright as Sirius.

In the table "O" means the total number of minutes of watch; "sky" the proportion of clear sky visible; "O'" the number of minutes corrected for "sky"; "Hindrance" other hindrances to visibility of meteors; "Mag. vis." the faintest stars visible; "F" the number of meteors seen in each interval of first column; and "R" the rate per hour; ($\cdot 92$) means seen with spectacles of that power.

WATCH FOR QUADRANTIDS, 1893-1894.

Time.	O.	Sky.	O'.	Hindrance.	[Mag. vis.	F.	R.	
12 mo. 30, 1893: h m h m 10.0 to 10.13	-	8	'5	4	Thin cloud? and partly town light.	6-5½	0	—
10.33 „ 11.18	-	16	'95	15	Thin cloud? - -	6	1	4
11.33 „ 11.48	-	7	'7	5	„ ? - -	6½	1	12
18.30 „ 18.50	-	2	1'	2	Thin cloud? and moon- light.	—	1	—
Total	-	33	—	26	—	—	3	4'6
12 mo. 31, 1893: 5.50 to 9.58	-	7	—	4	—	—	0	—
1 mo. 1, 1894: 10.36 to 11.18	-	16	'65	10'5	—	—	1	5'7
11.25 „ 12.17	-	13	'6	8	—	—	1	7'5
15.20 „ 15.43	-	19	'95	18	—	—	1	3'3
17.14 „ 17.51	-	22	'9	19	Slight moonlight -	6½	12	37'9
17.52 „ 18.4	-	12	'5	6	Moonlight, and much thin cloud.	5½-5	4	40
18.4 „ 18.32	-	15	'8	12	Slight moonlight -	6	7	35
('92) 18.56 „ 19.11	-	11	'5	5'5	Twilight to bright twi- light.	4½-4½	0	—
Total	-	108	—	79	—	—	26	19'7
1 mo. 2, 1894: ('92) 6.27 to 6.31	-	4	'5	2	Auroral light and town light.	6	0	—
7.3 „ 7.8	-	5	'5	2'5	—	6½-6	0	—
8.15 „ 8.20	-	4	'3	1'2	—	—	0	—
Total	-	13	—	6	—	—	0	—
1 mo. 4, 1894: 6.9 to 6.20	-	6	'6	4	Partly town light -	—	0	—
Grand Total	-	167	—	119	—	—	29	14'1

(The columns are as in previous reports.)

LYRIDS AND AQUARIDS OF APRIL—MAY.

The full moon at the time of the Lyrid shower made observations almost impossible. The evenings of April 22 and 23 were fixed upon for a combined watch, but almost nothing was seen. On the 25th six meteors were seen at Bridgwater, of which two may have been Lyrids, but no others were reported. On April 30 a watch was kept for Aquarids from 13^h 30^m till daylight, but none were seen. Mr. Milligan also watched several times in the morning hours without result, so that we may suppose that the

Aquarids, at any rate, did not return in any strength this year, and probably the Lyrids were also but feeble.

AQUARIDS OF JULY—AUGUST.

Of these interesting meteors eight were seen by the Director, commencing July 26, and lasting on through August. A bright meteor, on September 26, was almost certainly from this radiant, which was pretty well defined at $335^{\circ} - 14^{\circ}$. The meteors have very long courses, are generally white, and often have a train which lengthens out into a very thin streak. At about the same time there is another shower from near η Aquarii $338^{\circ} - 3^{\circ}$, but the meteors are shorter and quicker, and less interesting. There is also a shower of long slow meteors from near α Capricorni, lasting through the same period, but only two or three were seen this year.

PERSEIDS OF AUGUST.

In the South of England generally, the Perseid epoch was a time of very cloudy weather.

At Melpash Vicarage, Rev. S. J. Johnson reports weather singularly unfavourable. On August 8, one meteor; on August 9, watching from $10^h 32^m$ to $11^h 32^m$, only one meteor seen through breaks in the cloud. August 10 and 11, quite overcast.

At Bristol and Bridgwater similar conditions prevailed. Mr. Denning saw practically nothing, and the writer only registered 14 meteors from the whole Perseid group of radiants.

Mr. H. J. Townshend, who was staying at Paignton, Torquay, had better skies, and saw about 30 meteors, some of them very bright, which are recorded in the list of brilliant meteors. He found the Perseid radiant at $45^{\circ} + 51^{\circ}$, and one in Camelus on August 10, at $66^{\circ} + 59^{\circ}$.

Mr. Backhouse, at Sunderland, sends the following details of his watch, also a list of bright meteors given elsewhere, and he notes that "bright meteors seemed very numerous." (Mr. Backhouse's table follows.)

Mr. E. R. Blakeley, at Dewsbury, seems to have had the best view, and obtained observations on the 6th, 9th, and 10th, and gives the following table of radiants and also kindly furnishes a very interesting report on the details of the shower, so that we can form some idea of it, and of the large number of brilliant meteors which characterised it:—

Date.		Radiant.	No. of Meteors.
August 6	-	$40^{\circ} + 56^{\circ}$	5
" 6	-	$39 + 51$	8
" 9	-	$42 + 56$	17
" 10	-	$45 + 55$	24
" 10	-	$42 + 54$	16
" 10	-	$40 + 59$	9

"The above table shows the position of the radiant point of the Perseids between August 6 and 10, as observed at Dewsbury. Unfortunately, just when the shower seemed to promise the most interesting results, observations were rendered impossible owing to bad weather, but enough was seen to show that the shower was of extreme interest. The writer had intended to watch for the commencement of the shower, but clouds prevented until August 6, when 17 meteors were seen in one hour, of which 13 were Perseids. Two radiants were clearly marked, that at $40^{\circ} + 56^{\circ}$ giving brighter meteors than the one at $39^{\circ} + 51^{\circ}$, out of the five assigned to the former shower three being equal to or brighter than 1st mag.

"The rule was observed this year, as last, only to map meteors which were well observed, though all others were recorded to help the estimates for horary numbers.

"On August 9 only one radiant was apparent, and that of a rather diffuse character, though sufficiently well marked to assign its position to $42^{\circ} + 56^{\circ}$, with from 17 to 20 meteors. Length of watch two hours.

"On the night of the maximum, August 10, the writer decided to use two maps, the first (Map A) being used from $10^{\text{h}} 40^{\text{m}}$ to $12^{\text{h}} 15^{\text{m}}$. During this period about 24 Perseids were seen, giving a good radiant at $45^{\circ} + 55^{\circ}$. At $12^{\text{h}} 40^{\text{m}}$ observations were recommenced with Map B, and continued until $14^{\text{h}} 0^{\text{m}}$. And now it was that the interesting character of the shower became most manifest. For now two entirely fresh radiants came out: the one at $42^{\circ} + 54^{\circ}$ with about 16 meteors, and the other at $40^{\circ} + 59^{\circ}$, with about nine meteors; the two points being quite distinct. Some signs were still apparent of the former radiant at $45^{\circ} + 55^{\circ}$, but this was not distinctly marked. At $14^{\text{h}} 0^{\text{m}}$ a great bank of clouds came up and stopped all further work, nor was it fine again for a week, when the moon stopped observations of the end of the shower. I especially wish to call attention to the fact that the three radiants found on the 10th are not mere sections of a large area; each point comes out sharply, and is in no way confused with the others.

"It should be mentioned that on Map A are some indications of the radiant at $40^{\circ} + 59^{\circ}$ which came out afterwards on Map B.

"The hourly number of the Perseids will be seen from the following table:—

Date.	Time.	Dura- tion.	Do. dis- counted for Clouds, &c.	No. of Perseids.	Hourly Rate.
	h m h m	h m	h m		
6	12 20 to 13 25	1 5	1 0	13	13
9	11 30 to 13 25	1 55	1 50	20	11
10	10 40 to 11 40	1 0	0 52	23	27
10	11 40 to 12 10	0 30	0 20	8	24
10	12 40 to 13 40	1 0	0 55	32	35
10	13 40 to 14 0	0 20	0 15	8	32

"The number of bright meteors was much greater this year than last. Whereas last year the number of meteors equal to or brighter than Sirius was 20 out of about 250 meteors mapped, or 1 in 12, this year 15 out of about 90, or 1 in 6, were seen."

Mr. Booth at Leeds also succeeded in observing a double Perseid radiant. It will be remembered that last year some observers recorded this occurrence, but that Mr. Denning observing at the same time did not notice it. He is still inclined to be doubtful about it, saying that it may be so, but that he himself has not observed such a thing. It is much to be hoped that accurate observation or photography will in time settle this vexed question. The similar double radiant of Lyrids, of Quadrantids with Herculis, of Castor and Pollux Geminids (which last-mentioned twin shower Mr. Denning does allow), and large areas of radiation at the time of Orionids, Taurids and other minor showers, seem to point to some breaking up of the original meteor swarm, possibly by the annual collision with the earth, and it behoves all meteor observers to collect all the material they can for the solution of the whole problem of meteoric radiation and circulation in space.

At Belfast Mr. Milligan first noticed Perseids on August 4 with a radiant at $45^{\circ} + 57^{\circ}$, after which there seemed to be a lull in the shower, but on the 9th they were very active, and on the 10th more were seen. Other radiants seen by this and other observers at the same time as the Perseids will be given in the general list.

WATCH for METEORS during PERSEID PERIOD, 8 mo. 1894;
by T. W. BACKHOUSE, at Sunderland.

Day and Time.	of Minutes watching.	Sky.	Minutes con- sidered for sky.	Hindrance to Visibility.	Total Meteors seen.	Rate per Hour.	Perseids.
d h 5.11	5	1°	5	Slight twilight - -	0	—	0
h m h m 6.10.28 to 10.55	6	1°	6	Partly slight twilight -	1	10	0
12.0 „ 12.24	9	1°	9	—	1	6.6	1?
12.35 „ 12.55	10	1	10	—	0	—	0
Total	25	—	25	—	2	4.8	—
9.10.38 to 10.46	8	.8	6.4	—	1	10	1
10.51 „ 12.55	12	.8	9.6	—	3	18	2+1?
Total	20	—	16	—	4	15.0	—
10.10.59 to 11.11	12	.9	10.8	Slight moonlight -	7	38.2	7
11.17 „ 11.45	27	.93	25.1	Auroral light - -	19	45.6	15+1?
12.18 „ 13.24	17	.63	10.8	„ - -	8	43.6	8
Total	56	—	47	—	34	43.4	—
Grand Total	106	—	93	—	40	25.8	—

AUTUMN METEOR SHOWERS.

Moonlight and bad weather destroyed almost every chance of further work on the showers. Several observers attempted watches for Leonids in November, but only two or three were seen, it being full moon. Still, it is pretty certain there was no important return of the shower. Mr. Backhouse sends the following table of his watch for Leonids and Taurids.

WATCH for TAURID and LEONID METEORS, 1894;
by T. W. BACKHOUSE.

Time.	O.	Sky.	O'.	Hindrance.	F.	R.
11 mo. 5:						
h m h m						
6.51 to 7.0 - -	9	1°0	9	Moonlight - - -	0	—
7.28 „ 8.0 - -	6	1°0	6	„ - - -	0	—
9.15 „ 9.28 - -	12	1°0	12	Slight moonlight - -	0	—
Total - -	27	—	27	—	0	—
11 mo. 6:						
11 to 14.30 - -	5	1°0	5	—	1	12°0
14.56 „ 15.8 - -	6	1°0	6	—	0	—
Total - -	11	—	11	—	1	5°5
11 mo. 7 - -	6	°8	5	—	0	—
11 mo. 8:						
7.25 to 9.10 - -	19	1°0	19	Moonlight - - -	0	—
10 „ 12.27 - -	10	1°0	10	„ - - -	0	—
Total - -	29	—	29	—	0	—
11 mo. 9:						
9.45 to 12 - -	10	°9	9	Bright moonlight -	0	—
16.50 „ 17.5 - -	12	°9	11	„ - - -	2	10°9
Total - -	22	—	20	—	2	6
11 mo. 14:						
9 to 11.30 - -	5	°9	4	Bright moonlight -	0	—
11.50 „ 12 - -	6	1°0	6	„ - - -	0	—
Total - -	11	—	10	—	0	—
Grand Total -	106	—	102	—	3	1°7

THE ANDROMEDES cannot have been visible to any extent. Mr. Pope at Dingwall kept watch on the date of their return last time, November 23 and also 24, and saw nothing. At Bridgwater meteors were seen almost every night in the middle of November up to the 25th, on which night between 7^h and 11^h, only one meteor from Andromeda was seen, and the general hourly number

was only five. It was then cloudy until November 30, when in about three hours watching 13 meteors were seen, of which two may possibly have belonged to this shower.

THE TAURIDS were very scarce, only 25 being seen from Bridgwater during all the watches from the end of October into December. The usual radiant near α Tauri was scarcely marked, but there were three positions, one near the Pleiades at $55^\circ + 27^\circ$, another near Aldebaran at $67^\circ + 15^\circ$, and an intermediate position, probably the true Taurids at $57^\circ + 22^\circ$, but scarcely any of the 25 were from this radiant.

THE ARIETIDS, MUSCIDS, AND CETIDS were also feebly shown. The first mentioned produced nine meteors from $47^\circ + 19^\circ$, and 12 meteors were seen from near δ Tauri at $50^\circ + 6^\circ$. Last year so many bright ones were seen.

It was bright moonlight again at the time of the Geminids, December 9th to 13th, and scarcely any were seen. Mr. Milligan and others were on the look out, and the Director managed to secure seven of them with a radiant above Castor, at $111^\circ + 36^\circ$. He also suspected the Pollux radiant to be active as early as November 5, when eight small meteors gave radiants at $118^\circ + 20^\circ$ and $122^\circ + 26^\circ$.

GEMINID PERIOD, 1894.

Time.	O.	Sky.	O'.	Hindrance.	Mag. vis.	F.	R.		
12 mo. 7: h m h m									
11.12 to 11.29	-	7	1'	7	Bright moonlight	-	5½	0	—
11.40 „ 12.0	-	3	8	2'	„	-	5½	0	—
16.2 „ 16.27	-	17	1'	17	—	—	2	—	—
Total	-	27	—	26	—	—	2	4.6	—
12 mo. 8:									
6.40 to 7.0	-	11	1'	11	Bright moonlight and misty.	4½	—	—	—
8.45 „ 9.30	{	13	1'	13	„	4½	—	—	—
(.92)*	6	1'	6	„	4½	—	—	—	—
10 „ 11.5	-	5	1'	5	„	3-4½	—	—	—
Total	-	35	—	35	—	—	0	0	—
12 mo. 13:									
9 to 11.59	-	26	1'	26	Bright moonlight	-	4	0	0
Grand Total	-	88	—	87	—	—	2	1.4	—

The important shower of slow meteors from near β Tauri in the first week of December, was also very feeble this year, only three being seen at Bridgwater during several watches. A good deal of the evidence is therefore only negative in 1894, but may be useful at some future time in estimating the dates of maxima and minima of the showers.

List of Meteor Radiants observed in 1894.

The following list contains all the positions of meteor shower radiants which are of any value; but the bad weather has made it impossible to bring together a sufficient number of tracks, and many of them must be taken as very doubtful. In most cases, however, they represent showers previously observed and therefore have an interest, showing that the shower is still active.

The description of the classes will be found in last years' report. The first column is a continuation of the British Astronomical Association list of radiants and is carried on from year to year.

A number of meteor paths have been kindly sent by Prof. A. S. Herschel, many of which help up some weak position.

Observers.—B. = E. R. BLAKELEY.

C. = H. CORDER.

D. = W. F. DENNING.

H. = A. S. HERSCHEL.

M. = W. H. MILLIGAN.

T. = H. J. TOWNSEND.

Y. = OBSERVERS AT BOOTHAM SCHOOL, YORK.

Meteor Radiants, 1894.

B.A.A. Ref. No.	Date.	Name.	Position.	No. of ψ's.	Class.	Ob- server.
347	Jan. 1-2	Quadrantids -	$219^{\circ} + 53^{\circ}$	14	Slowish - -	C.
348	" 1-2	} Herculids - {	$240^{\circ} + 48^{\circ}$	} 6	Swift - -	C.
349	" 1-2		$231^{\circ} + 43^{\circ}$			
350	" 1-2	Monoceros -	$124 - 5$	—	Quick - -	D.
351	" 1-2	Gemini -	$107 + 25$	—	Quick - -	C.D.
352	Dec.-Jan.	Lynx - -	$137 + 38$	9	Quick - -	C.
353	Jan. 1	δ Ursæ Maj. -	$180 + 56$	3	Slow - -	C.
354	" 1-2	β Tauri -	$85 + 28$	4	- - -	C.
355	Mar. 4	Ursa Maj. -	$136 + 58$	—	Quick - -	B.
356	Mar.-Apr.	Coronids -	$236 + 39$	3	Quick - -	C.
357	"	ε Bootis -	$215 + 29$	2	Swift - -	C.
358	"	α Lyrae -	$279 + 40$	3	Slow - -	C.
359	April 9	Corvus - -	$206 - 15$	2	Swift - -	C.
360	" 23	α Capricorni -	$309 - 17$	3	Swift - -	H.C.
361	" 30	α Pegasi -	$347 + 18$	4	- - -	H.C.
362	April	Pisces - -	$344 - 5$	—	- - -	H.
363	" -	Equuleus -	$313 + 6$	—	- - -	H.
364	May -	Aquarids -	$325 - 3$	2	Swift - -	M.
365	July-Aug.	Aquarids -	$335 - 14$	8	Slow - -	C.
366	"	η Aquarii -	$338 - 2$	3	Slow - -	B.

B.A.A. Ref. No.	Date.	Name.	Position.	No. of ψ's.	Class.	Ob- server.
367	1894. July-Aug. -	η Aquarii -	338° - 3°	7	Slow - -	C.
368	" -	Capricornids -	305° - 16°	2	Slow - -	C.
369	" -	Equuleus -	312° + 6°	3	Quick - -	C.
370	" -	μ Cygni -	324° + 31°	4	Quick - -	C.
371	" -	θ Lyræ -	290° + 38°	3	Quick - -	C.
372	" -	β Aurigæ -	86° + 46°	5	Swift - -	C.
373	" -	Polarids -	290° + 87°	4	Quick - -	B.
374	" -	Polarids -	300° + 88°	4	Quick - -	C.
375	" -	Cassiopeids -	20° + 66°	5	Swift - -	B.
376	" -	Cassiopeids -	15° + 64°			
377	" -	Cassiopeids -	16° + 58°	3	Swift - -	C.
378	" -	Cassiopeids -	25° + 70°	—	Swift - -	M.
379	" -	Andromeda -	5° + 35°	—	- - -	M.
380	" -	Andromeda -	5° + 50°	—	- - -	M.
381	" -	Pisces -	8° + 20°	—	Quick - -	M.
382	Aug. -	Cygnids -	282° + 46°	3	Swift - -	B.
383	" -	γ Cephei -	350° + 75°	3	Quick - -	B.
384	" 6 -	Perseids -	45° + 57°	—	Swift - -	M.
385	" 6 -	Perseids -	40° + 56°	5	Swift - -	B.
386	" 6 -	Perseids -	39° + 51°	6	Swift - -	B.
387	" 6 -	Perseids -	36° + 59°	4	Swift - -	B.
388	" 8 -	Perseids -	47° + 57°	4	Swift - -	C.
389	" 9 -	Perseids -	42° + 56°	17	Swift - -	B.
390	" 10 -	Perseids -	45° + 55°	24	Swift - -	B.
391	" 10 -	Perseids -	42° + 54°	16	Swift - -	B.
392	" 10 -	Perseids -	40° + 59°	9	Swift - -	B.
393	" 10 -	Perseids -	45° + 51°	15	Swift - -	T.
394	" 10 -	Camelids -	66° + 59°	5	Swift - -	T.
395	" 25 -	Camelids -	66° + 60°	4	Swift - -	C.
396	Aug. -	γ Persei -	41° + 54°	2	Swift - -	C.
397	" -	α Persei -	43° + 51°	4	Swift - -	C.
398	" 26-29 -	κ Cephei -	300° + 80°	7	Quick - -	C.
399	" 26-29 -	κ Cephei -	305° + 78°	2	Quick - -	B.
400	Aug. -	θ Draconis -	248° + 55°	3	Quick - -	C.
401	Sept. -	α Cygni -	315° + 46°	4	Quick - -	C.
402	" -	φ Andromedæ -	20° + 49°	5	Quick - -	C.
403	" -	ξ Draconis - {	275° + 53°	7	Quick - -	C.
404	" -		277° + 57°			
405	" -	Camelus -	88° + 74°	10	Swift - -	B.C.

B.A.A. Ref. No.	Date.	Name.	Position.	No. of ψ's.	Class.	Ob- server.
406	1894. Sept. -	Triangulum -	$30^{\circ} + 15^{\circ}$	4	Quick - -	B.
407	Sept.-Oct. -	Aquarids -	$327 - 12$	3	Slow - -	C.
408	" -	ξ Cygni -	$314 + 29$	6	Slow - -	C.
409	Oct.-Nov. -	γ Geminids -	$97 + 18$	5	Swift - -	C.
410	" -	Aurigids - {	$84 + 49$	15	Quick - -	C.
411	" -		$70 + 44$			
412	" -	Hydra -	$135 - 5$	—	Swift - -	C.
413	" -	Hydra -	$152 - 13$	—	Swift - -	C.
414	" -	Arietids -	$47 + 19$	9	Slow - -	C.
415	" -	Arietids -	$38 + 23$	4	Slow - -	B.
416	" -	Cetids -	$50 + 6$	12	Slow - -	C.
417	" -	Taurids -	$55 + 19$	—	Slow - -	B.
418	" -	Taurids -	$57 + 22$	10	Slow - -	C.
419	" -	Pleiades -	$55 + 27$	9	Slow - -	C.
420	" -	α Taurids -	$67 + 15$	6	Slow - -	C.
421	Nov. 2 -	Camelus -	$171 + 82$	4	Quick - -	C.
422	" 2 -	ο Ursæ Maj. -	$119 + 63$	5	Slowish - -	C.
423	" 5 -	Geminids - {	$118 + 29$	8	Quick - -	B.C.
424	" - -		$122 + 26$			
425	" 5 -	ο Leonis -	$142 + 15$	3	Swift - -	C.
426	Nov. -	Leonids -	$152 + 27$	4	Swift - -	C.
427	" - -	ξ Tauri -	$86 + 20$	5	Quick - -	C.
428	" - -	β Cephei -	$325 + 70$	3	Slow - -	C.
429	" - -	Draconids -	$290 + 60$	6	Slow - -	C.
430	" - -	Canes Venat. -	$185 + 44$	4	Swift - -	C.H.Y.
431	" - -	Canes Venat. -	$210 + 40$			
432	" - -	Lynx -	$140 + 41$	3	Swift - -	C.
433	" - -	Perseus -	$39 + 57$	3	Quick - -	C.
434	" - -	Monoceros -	$92 - 7$	—	Swift - -	B.
435	" - -	Canis Major -	$113 - 15$	2	Swift - -	C.
436	" - -	Cygnids -	$314 + 51$	—	Quick - -	Y.
437	" - -	α Hydræ -	$147 - 7$	—	Swift - -	H.Y.
438	Nov.-Dec. -	Taurids -	$55 + 18$	—	Slow - -	B.C.
439	" -	Cetids -	$29 - 8$	4	Slow - -	B.C.
440	" -	Leonids -	$155 + 25$	4	Swift - -	C.
441	Dec. - -	θ Ursæ Maj. -	$141 + 50$	4	Quick - -	C.
442	" - -	Geminids -	$111 + 36$	7	Quick - -	C.
443	Dec.-Jan. -	Eridanids -	$62 - 23$	3	Slow - -	T.D.C.
444	Dec. - -	Monoceros -	$90 - 12$	—	Swift - -	T.
445	" - -	Canes Venat. -	$183 + 42$	—	Swift - -	T.

BRIGHT METEORS OBSERVED BY MEMBERS OF THE BRITISH
ASTRONOMICAL ASSOCIATION.

Date.	Time.	Mag.	Remarks.
1894. Jan. 1 -	h m 17 26	Sirius	Yellow, directed from about $\frac{1}{2}$ (ι, γ) Cancri, passed $\frac{3}{4}$ (β, α) Canis Min., and went 6° further. Slowish.—T. W. BACKHOUSE.
" 25 -	10 1	4	Green, directed from about Jupiter, disappeared behind house at $75\frac{3}{4} - 25^\circ$. Very slow, behind cloud, may have been brighter.—T. W. B.
" 25 -	10 1	(From $242^\circ + 59^\circ$ to $220^\circ + 53^\circ$, but not seen at commencement. Very brilliant, burst into two fragments (<i>see</i> special note).—W. F. DENNING.
Feb. 9 -	12 32	> 9	Daylight meteor, metallic green, turning blue green. Visible $1\frac{1}{2}$ secs. (<i>see</i> special note).—J. WYKES.
" 21 -	7 18	4	From $253^\circ + 54^\circ$ to $253\frac{1}{2}^\circ + 49^\circ$, low in the north.—W. F. D.
" 26 -	8 0 $\frac{1}{2}$	> 1	About 2° below ν Hydrae, falling perpendicularly.—REV. S. J. JOHNSON.
Apr. 22 -	7 35	(Green, red sparks $\frac{1}{2}$ (α, β) Leonis down between Corvus and Crater (<i>see</i> special note).—F. J. WARDALE.
" 25 -	10 14	> 1	From $218^\circ - 11\frac{1}{2}^\circ$ to $222^\circ - 8^\circ$. Green, slow, train of sparks; a small fireball. Radiant $205^\circ - 15^\circ$ — H. CORDER.
" 25 -	11 17	1	From $157\frac{3}{4}^\circ + 10^\circ$ to $150^\circ \pm 0^\circ$. Long train of brilliant sparks.—REV. R. BEAMISH SAUL.
" 29 -	14 8	> 9	From $248^\circ - 20^\circ$ to $249^\circ - 25^\circ$. Duration 3 secs. Probably near radiant $248^\circ - 20^\circ$ as almost stationary.—W. H. MILLIGAN.
May 1 -	10 25	> 1	From near θ Lyrae towards N.W. horizon. Yellowish slight trail.—G. T. DAVIS.
" 12 -	12 3	> 1	Passed 2° below η Aquilae, vanished 3° below ν Ophiuchi.—REV. S. J. J.
" 26 -	11 55	4	From $270^\circ - 16^\circ$ to $281^\circ - 17^\circ$. Emerald green. No train. $9\frac{1}{2}$ m. later a faint but distinct detonation.—D. E. PACKER.
June 28 -	12 46	1 $\frac{1}{2}$	From near δ Lyrae below θ Cygni almost to α Cephei. Red.—REV. S. J. J.
" 30 -	12 19 $\frac{1}{2}$	1 $\frac{1}{2}$	From 1° S. of α Andromedae. Vanishing in centre of square of Pegasus. Red. Duration, 3 secs.—REV. S. J. J.
July 5 -	12 0	> 1	From ν to γ Bootis.—REV. S. J. J.
" 12 -	10 6	> 1	From $211^\circ + 65^\circ$ to $359^\circ + 78^\circ$. Steel blue. Swift. No train.—H. J. TOWNSHEND.
" 13 -	10 40	4	From $165^\circ + 85^\circ$ to $183^\circ + 30^\circ$. Brilliant blue and red, burst below Cor Caroli, 3 secs.—H. J. T.
" 26 -	10 58	> 1	From $295^\circ - 1^\circ$ to $302^\circ - 5^\circ$. Slow, orange, with train and streak.—H. C.
" 26 -	11 43	> 1	From $319^\circ - 4^\circ$ to $298^\circ - 15^\circ$. Slow, white. Faint streak. Aquarid.—H. C.
" 27 -	9 38	> 1	From near α Cygni to Mizar.—G. T. D.
" 27 -	10 3	> 1	From ϵ Delphini to η Aquilae. Streak.—G. T. D.

Date.	Time.	Mag.	Remarks.
1894. July 27 -	h m 11 55	Sirius	From $326^{\circ} + 37^{\circ}$ to $326^{\circ} + 25^{\circ}$. Greenish. Quick.—H. C.
" 30 -	11 8½	1½	Passed between γ Ophiuchi and η Serpentis. Vanishing 5° W. of ν Ophiuchi. Flashing.—REV. S. J. J.
Aug. 6 -	12 21	Sirius	Directed from 41 Arietis, dis. $\frac{2}{3}$ (α Piscium, δ Ceti). Course 6° . Burst out brightly, and became green near dis. faint streak. ? Perseid.—T. W. B.
" 6 -	13 15	2	From $327^{\circ} + 29^{\circ}$ to $351^{\circ} + 3^{\circ}$. Slow, with flash. Cygnid.—E. R. BLAKELEY.
" 8 -	11 10	1	Passed 10° W. of ϵ Pegasi to ζ Aquarii. Reddish.—REV. S. J. J.
" 9 -	10 14	>1	From $33^{\circ} + 54^{\circ}$ to $359^{\circ} + 75^{\circ}$. 2 secs. Swift, short, with bent course. Very brilliant, bursting out red and blue.—H. J. T.
" 9 -	10 44	2	Directed from about $\frac{1}{2}$ (δ Persei, Cap.) dis. $\frac{1}{2}$ (α , β) Cephei. Course 12° . Orange, beautiful. Bright streak left, 2 secs. Perseid.—T. W. B.
" 9 -	12 16	Sirius	From $42\frac{1}{2}^{\circ} + 27^{\circ}$ to $44^{\circ} + 12^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 9 -	12 44	2	From $31^{\circ} + 16^{\circ}$ to $27^{\circ} - 4^{\circ}$. Swift, streak. Perseid.—E. R. B.
" 9 -	13 16	4th	Commenced at $340^{\circ} + 68^{\circ}$; when near α Cygni it turned at an angle, passing from $304^{\circ} + 46^{\circ}$ to $286^{\circ} + 38^{\circ}$. Very swift.—E. R. B.
" 10 -	10 0	>1	From $2^{\circ} + 59^{\circ}$ to $282^{\circ} + 43^{\circ}$. Brilliant blue and red. 3 secs. Burst at Vega. Streak.—H. J. T.
" 10 -	10 3	Sirius	From $60^{\circ} + 51^{\circ}$ to $98^{\circ} + 47^{\circ}$. Brilliant blue. 2 secs.—H. J. T.
" 10 -	11 1	Vega	Directed from γ Cephei, passed exactly $\frac{1}{2}$ (κ Cephei, δ Draconis). Deep yellow, left bright streak for 2 secs. Perseid.—T. W. B.
" 10 -	11 9	2	Disappearance about 2° from β Ceti towards γ Cancri. Perseid.—T. W. B.
" 10 -	11 12	2	From $95^{\circ} + 77^{\circ}$ to $170^{\circ} + 69\frac{1}{2}^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	11 28	Sirius	Near π Capricorni? Perseid.—T. W. B.
" 10 -	11 30½	Sirius	From $75^{\circ} + 51\frac{1}{2}^{\circ}$ to $94^{\circ} + 45\frac{1}{2}^{\circ}$. Very swift. Streak Perseid.—E. R. B.
" 10 -	11 35	1-2	From $43^{\circ} + 30^{\circ}$ to $43^{\circ} + 15^{\circ}$. Flashed out at end. Swift streak. Perseid.—E. R. B.
" 10 -	11 35	Sirius	Directed from ν Andromedæ, passed near 51 Piscium. Left streak for 3 secs. Perseid.—T. W. B.
" 10 -	11 37½	Sirius	From $58^{\circ} + 40^{\circ}$ to $65^{\circ} + 30^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	11 39	2	Passed γ Trianguli, passing β Arietis. Very beautiful. Left bright streak. 3 secs. Perseid.—T. W. B.
" 10 -	12 5	2	From $90^{\circ} + 64^{\circ}$ to $125^{\circ} + 58\frac{1}{2}^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	12 10	Sirius	From $10^{\circ} + 14^{\circ}$ to $360^{\circ} - 8^{\circ}$. Swift. Streak. Perseid.—E. R. B.

Date.	Time.	Mag.	Remarks.
1894. Aug. 10 -	h m 12 22	Sirius	Directed from $1\frac{1}{2}^{\circ}$ above α Trianguli, passed $\frac{1}{2}$ above ξ Piscium. Orange. Left bright streak, faintly for 4 secs. Perseid.—T. W. B.
" 10 -	12 49	Sirius	From $75^{\circ}+75^{\circ}$ to $155^{\circ}+73^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	12 59 $\frac{1}{2}$	Sirius	Passed ϵ Pegasi and 1° S. f. δ Equulei. Left streak for 3 secs. Perseid.—T. W. B.
" 10 -	13 8	4	From $34^{\circ}+24^{\circ}$ to $31^{\circ}-1^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	13 18	4	From $43\frac{1}{2}^{\circ}+32^{\circ}$ to $43\frac{1}{2}^{\circ}+10^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	13 20	4	From $335^{\circ}+71\frac{1}{2}^{\circ}$ to $273^{\circ}+50^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	13 21 $\frac{1}{2}$	4	From $78^{\circ}+50^{\circ}$ to $96^{\circ}+43^{\circ}$. Swift. Streak. Perseid.—E. R. B.
" 10 -	13 25 $\frac{1}{2}$	Sirius	From $339^{\circ}+25^{\circ}$ to $357^{\circ}+18^{\circ}$. Streak. Cygnid.—E. R. B.
" 10 -	13 40	9	From $87^{\circ}+59\frac{1}{2}^{\circ}$ to $112^{\circ}+55^{\circ}$. Swift. Streak. Bright yellow. Flash behind cloud. Perseid.—E. R. B.
" 10 -	13 45	Sirius	From $28\frac{1}{2}^{\circ}+11^{\circ}$ to $27^{\circ}+2^{\circ}$. Swift. Streak. Flash. Perseid.—E. R. B.
" 20 -	8 35 $\frac{1}{2}$	$\frac{1}{2}$ C	From nearly midway between ζ Aquilæ and α Ophiuchi. Vanishing about 4° E. of γ Ophiuchi. Fireball.—REV. S. J. J.
" 26 -	10 20	>9	Brilliant flash. Meteor not seen, but streak left about $138^{\circ}+62^{\circ}$ to $137\frac{1}{2}^{\circ}+58\frac{1}{2}^{\circ}$ (see special note).—H. C.
" 26 -	10 44	8	From $352^{\circ}+38^{\circ}$ to $364^{\circ}+37^{\circ}$. Slow. Orange red, dying out as a spark.—H. C.
Sept. 6 -	9 21	>1	About 4° above α Arietis. Shot horizontally towards S. for a few degrees.—REV. S. J. J.
" 8 -	11 3	$\frac{1}{2}$ C	From $337^{\circ}-4^{\circ}$ to $348^{\circ}-24^{\circ}$. Probably same as next (see special note).—H. J. T., Leeds.
" 8 -	11 10	9	From $142^{\circ}+54^{\circ}$. Disappeared behind house at $144^{\circ}+51^{\circ}$. Slow. Green fireball, with spark train.—H. C.
" 26 -	8 3	>1	From $240^{\circ}+39^{\circ}$ to $195^{\circ}+37\frac{1}{2}^{\circ}$. Slow. Orange. Train and sparks. Aquarid. Radiant $327^{\circ}-12^{\circ}$ —H. C.
" 26 -	10 53	4	From direction of α Persei to just past κ Lyrae, leaving a conspicuous streak 30° in length, lasting 6 secs.—G. T. D.
" 27 -	11 0	4	From $65^{\circ}+25^{\circ}$ to $75^{\circ}+50^{\circ}$. Slow. Streak.—E. R. B.
Oct. 29 -	7 21 $\frac{1}{2}$	1	From 68 Hercules to 2° past 98 Hercules.—REV. S. J. J.
Nov. 2 -	14 20	Sirius	Very slow. Spark train. 5 secs.—E. R. B.
" 2 -	15 1	4	Very slow. Train.—E. R. B.
" 3 -	13 13	>1	Quick. Green. Streak. ? Ursid.—H. C.
" 5 -	9 29	>9	From 5h. om. + $13\frac{1}{2}^{\circ}$ to 6h. 10m. + 10° . Slow. Straw colour to steel blue, with red sparks. Slight train.—F. J. WARDALE.
" 5 -	10 27	4	Swift.—E. R. B.
" 6 -	8 59	2×4	Slow. see Blue, feathery train.—J. O. HURST, per E. R. B.

Date.	Time.	Mag.	Remarks.
1894. Nov. 17 -	h m 7 46	> 4	From $314^{\circ} \pm 0^{\circ}$ to $306^{\circ} - 8^{\circ}$. Imperfectly observed.— W. F. D.
„ 17 -	7 46	♂	From $342^{\circ} + 20^{\circ}$ to $301^{\circ} + 13^{\circ}$. Slow. Orange. Train. Radiant probably $54^{\circ} + 27^{\circ}$ near Pleiades. Same as above.—H. C.
Dec. 22 -	8 12	♂	Slow. Orange. Train. Low down in Pisces. Directed from 1° N. of β Tauri.—H. C.
„ 27 -	8 35	♂	Slow. Orange. From near ϵ Geminorum to α Orionis. —REV. R. B. SAUL.
„ 27 -	10 55	♂	Slow. Taurid in Monoceros.—D. BOOTH, Leeds.

Observers.—T. W. BACKHOUSE, Sunderland.

E. R. BLAKELEY, Dewsbury.

H. CORDER, Bridgwater.

G. T. DAVIS, Reading.

W. F. DENNING, Bristol.

REV. S. J. JOHNSON, Melplash Vicarage, Bridport.

W. H. MILLIGAN, Belfast.

D. E. PACKER, King's Heath, Birmingham.

REV. R. BRAMISH SAUL, Weston.

H. J. TOWNSHEND, Paignton (July, August), then Leeds.

F. J. WARDALE, Knebworth, Herts.

J. WYKES, Birmingham.

Observations of Brilliant Fireballs, and doubly observed Meteors.

Our members have had the good fortune to see something of most of the great and remarkable meteors of 1894, and although Mr. Denning and others have already collected and discussed their observations, yet this report would lose its most interesting feature if these meteors were only relegated to the general list.

METEORS OF JANUARY 1.

On the evening of January 1, 1894, at about 10.9, a meteor was seen by Mr. Denning, and by H. Corder, of about the 1st mag., or 2nd mag. as seen from Bridgwater, which appeared at a height of 50^m , a little N. of Amesbury (Wilts), and disappeared at a height of 34^m , rather W. of Devizes, having traversed a path of 20^m in the direction of Pilning, Glos., where it would have fallen if it had not been dissipated in the air. Its radiant was in Gemini ($107^{\circ} + 25^{\circ}$, Az. 303° , Alt. 53°).

The next meteor is of the second magnitude only, on January 1, 1894, at 10.43, and was seen by Mr. Denning from Bristol, and by Prof. A. S. Herschel from Slough. It appears from Mr. Denning's observations to have been a Virginid (Rad. $185^{\circ} + 15^{\circ}$, Az. 250° W. of S. Alt. 3°), and appeared first at a height of

80 miles over Rickmansworth, and disappeared at a height of 77 miles over a point 7^m S.S.W. of Hungerford, having traversed a path of 52 miles.

METEOR OF JANUARY 2.

On January 2, at 9.40, a meteor, appearing of the 3rd mag. to Prof. Herschel, and of the 2nd mag. to H. Corder, fell from a height of 65 miles over Cirencester to 55 miles over Cranborne, a path of 53 miles. This meteor had a long streak, and though not a true Quadrantid, yet it emanated from the part of Hercules nearest to Quadrans, the radiant being at $240^{\circ} + 48^{\circ}$, from which several others were seen on that and the previous evening. (Az. 184° , Alt. 10°).

GREAT DETONATING FIREBALL OF JANUARY 25.

Mr. Denning has already published a most interesting account of this meteor ("Monthly Notices," Vol. LIV., No. 5), and it will only be necessary to notice briefly the observations of our members. The phenomenon occurred at 10.1, the sky generally being in a bad condition, only the brighter stars being visible.

At Bristol, Mr. Denning states, that although he was passing a street lamp at the time the brilliance of the meteor startled him, and looking up he saw a double-headed fireball just before its disappearance. The observed path was from $242^{\circ} + 59^{\circ}$ to $229^{\circ} + 53^{\circ}$, but was not nearly the whole of the real path. Near the end of its course the fireballs subdivided and became a string of particles. No sound of the explosion was heard. From Sunderland through the clouds the meteor appeared to Mr. Backhouse of a green colour, and about as bright as Jupiter. Its progress was very slow, and it disappeared behind a house.

Mr. D. E. Packer had a fine view of it from King's Heath, where it left a train of great length in its wake. It traversed an arc of 120° passing between Jupiter and the Pleiades, and breaking up near Rigel, after lasting about 12 seconds. The meteor sent out a distinct hissing sound during part of its passage, and three minutes after bursting the boom of its explosion was heard. The report was a double one, and was followed by a dull reverberation from all parts of the sky.

Mr. Denning calculates the true path of the meteor to have been from a height of 89 miles over a point in lat. $53^{\circ} 42' N.$, long. $4^{\circ} 7' W.$ (24 miles N.N.E. of Amlwch, Anglesey), and after traversing 160 miles, at the rate of 18 miles per second, it disappeared over Ashchurch, Tewkesbury, at a height of only 16 miles, and from the whirring sounds heard, it is possible that fragments may have fallen, the earthpoint being at Lechlade in Gloucestershire. The radiant point is at $331^{\circ} + 55^{\circ}$ near ϵ Cephei. It will be within the memory of all how tremendous was the sound of the explosions at places as near as Worcester, Malvern, and Droitwich, where much alarm was felt, at the loud detonations and shaking of buildings; and the brilliancy was greater than that of the full moon, showing how rapidly both sound and light fell off at places not more distant than Bristol or Sunderland. According to some accounts one or more brilliant meteors were seen on the same evening besides the great fireball.

GREAT FIREBALL OF FEBRUARY 8.

The next important meteor is the great daylight fireball, of February 8, an account of which has been published by Prof. A. A. Rambaut in the proceedings of the Royal Dublin Society (Vol. VIII., Part III., No. 29).

Not many others of our members had the fortune to see this fine sight, but Mr. J. Wykes, of Bournbrook, Birmingham, writes, "I saw yesterday (February 8), a most brilliant meteor in bright sunshine. The colour was a bright metallic green, more intense at the head; and gradually toning down to a blue green. It came from a S.E. direction, and was visible for about $1\frac{1}{2}$ seconds. Time 12.32." An outline sketch accompanies the letter, showing the meteor to have been of a wedge or pear-shape. Notices from non-members have also come in, one sent by Mr. Longstaffe is a description of the meteor as seen from Wimbledon Common by Miss K. Gertrude Tee, who says that in a cloudless sky, the meteor appeared with a "bright white light, like the sun shining on a steel bar. It was visible for a few seconds, and then sank in the north."

Mr. R. W. Christy also wrote to the Director from Roxwell, near Chelmsford, stating that he had seen it there. From Prof. Rambaut's calculations, it would seem that the meteor appeared over the estuary of the Ribble, at the height of nearly 60 miles, and after travelling across Lancashire and part of Yorkshire at a speed of 19 miles per second, it finally disappeared at a height of 14 miles over a spot about three-fifths of the distance from Sheffield towards Wakefield; but from a number of observations the path would seem to have been decidedly curved, and therefore no radiant point could be determined.

FIREBALL OF APRIL 22.

Mr. F. J. Wardale, writing from Knebworth, Herts, says:—"Yestereve (22nd), at 7.35 p.m., as near as possible, I observed a fine fireball in the S.E. Owing to the brightness of the twilight, few stars were visible, and an absolutely accurate path I cannot give, but by watching till more stars appeared, the meteor may be said to have started about half way between α and β Leonis, and moved down in a slightly curved path till between Corvus and Crater. Its colour was a vivid green, with a trail of red sparks, and these became larger and more numerous near the end of its course, and it finally broke up into a ruddy cluster, the motion of which could be traced for 2° or 3° beyond. Duration about four or five seconds. The brightness is difficult to estimate, the full moon similarly situated would perhaps have been rather brighter. Its diameter appeared about $6'$ of arc."

Mr. R. W. Christy also saw it from near Chelmsford, giving the time as 7.40, and says it was "much brighter than any planet, and in view two or three seconds. Its course was from close to α Leonis to a little short of Corvus, which had only just become visible. It was a whitish light and left a brilliant track behind it." Mr. Denning finds that the meteor descended from a height of about 80 miles above the neighbourhood of

Hastings, and crossing over the Straits of Dover, with a real path of about 120 miles, which it traversed in about four seconds; it disappeared over Amiens at a height of 17 miles. Radiant in Perseus.

DETONATING METEOR OF MAY 26.

Mr. D. E. Packer writes from Birmingham, "At 11.55 p.m. a "magnificent fireball, of a most beautiful emerald green, passed "slowly in a horizontal direction (describing a slight curve in its "passage) from $270^{\circ}-16^{\circ}$ to $281^{\circ}-17^{\circ}$ in Sagittarius. Duration "3 seconds. No trail. About $9\frac{1}{2}$ minutes after 'a faint but "distinct detonation was observed from that direction. Mag.= "Jupiter."

PERSEID METEOR OF AUGUST 10.

A large number of brilliant Perseids were seen from the few places where the sky was clear, but only the following one has had its real path worked out by Mr. Denning, as in general the meteors were only single observations. Some of these are noticed in the account of the shower. Mr. T. W. Backhouse registered a meteor equal in brightness to Sirius as seen from Sunderland at 11.35, and Mr. E. R. Blakeley appears to have seen the same object from Dewsbury, estimating the brightness as equal to Jupiter. Mr. Denning finds the radiant in Perseus to have been at $43^{\circ}+58^{\circ}$ in az. 226° W. of S., alt. 43° . The meteor commenced 52 miles over North Sea, lat. $54^{\circ} 16' N.$, long. $0^{\circ} 55' E.$, and ended 16 miles high over North Sea, 14 miles E.S.E. of Hornsea, lat. $53^{\circ} 55' N.$, long. $0^{\circ} 10' E.$ The earth point was on the River Humber, 3 miles S.E. of Burstwick, Yorks. The real length of path was 54 miles.

BRILLIANT METEOR AND COSMIC CLOUD OF AUGUST 26.

This remarkable object was well seen, at any rate in its later stages, over a great part of central England, and deserves special notice for its lasting streak. The meteor which caused it was a Cepheid, its radiant point being at $305+79$ near κ Cephei, and, as was found last year, meteors both from this constellation and the accompanying Cygnids had a manner of flashing out suddenly near the end of their course, leaving a short persistent streak. At Bridgwater, the writer was watching the southern sky, and his attention was called at $10^h 20^m$ to a brilliant flash on the houses and sky, and turning round, saw the short straight streak lying vertically in the fore part of Ursa Major at from $138^{\circ}+62^{\circ}$ to $137\frac{1}{2}^{\circ}+58\frac{1}{2}^{\circ}$. As seen with a binocular it was of a pearly-green colour, and at once began to curve in the middle into a sickle shape, and to become knotted into cloudlets. It next became Z-shaped, and the extremities dying out, the bright centre lengthened into a club-shaped cloud, and drifted away upwards, becoming gradually fainter until it was finally lost sight of with the naked eye at 10.50, half-an-hour from its formation, at a position of $98^{\circ}+64^{\circ}$. It was lost in the binocular some time before this from want of contrast. The most interesting account which has been sent in is that by Mr. D. E. Packer, who observed the phenomenon from King's Heath, near Birmingham, and whose story of the changes

in the streak must be quoted almost *in extenso*. The instrument employed was a telescopic camera of 4-in. aperture and 2 ft. focal length, but as Mr. Packer had only just focussed his instrument, he unfortunately had no photographic plates at hand, and he says. "I had to content myself with an eye observation with a single lens giving a power of about 20. I was agreeably surprised to perceive a serpentine array of luminous circular plates, slightly overlapping each other and showing distinctly various iridescent hues, resembling mother-of-pearl. This beautiful appearance was very transient, the respective portions gradually merging into each other, but still retaining a hard outline for several minutes. I kept the object steadily in view, and noted its relative positions from its starting point near η Ursæ, to the point of drift : Draconis. In 9 minutes it had drifted exactly midway from its two extreme points, and in 17 minutes it formed a halo round ϵ Draconis, the star being as nearly central in the cloud as it was possible to determine. I noted particularly that the cloud in its passage did not obstruct the light of telescopic stars beyond what its inherent luminosity would have alone effected. The cloud was seen for 20 minutes, when a haze crept up and obscured the sky. Its diameter when covering ϵ Draconis was fully 2° ."



A number of other accounts were collected by Mr. Denning, who calculated the height at beginning as 90 miles over the Mersey, and at ending 30 miles over a point 3 miles E. of Ruthin, Denbighshire. The earth point at 6 miles S. of Llangollen, and real length of path 66 miles. The streak was 8 miles in length, and moved along horizontally at a height of 54 miles from 6 miles N.E. of Denbigh to 6 miles W. of Wolverhampton at a rate of 122 miles an hour. From Mr. Packer's estimate of the apparent

size of the streak at $10^h 37^m$ it must have been about 4 miles in diameter.

Many observers noticed that the streak lasted some three or four minutes, but very few seem to have watched it longer or noticed the drift. Observers at Sidcot School, Weston-super-Mare, note that it lit up the landscape, and Mr. Burcham of Cirencester (per Miss E. Brown) seems to have been one of the few who saw the meteor, and speaks of it as slightly violet and three to four times as bright as a first mag. star.

GREEN FIREBALL OF SEPTEMBER 8.

At Bridgwater on this date, a few minutes past 11^h , a fine emerald green fireball was seen to fall near θ Ursæ Majoris in the northern sky, and to disappear behind a roof, the observed path being from $140^\circ + 54^\circ$ to $144^\circ + 151^\circ$. It had a short train of red sparks and moved slowly. At $11^h 3^m$ Mr. H. J. Townshend, at Leeds, saw what was almost certainly the same body falling in the S. in Aquarius from $337^\circ - 4^\circ$ to $348^\circ - 24^\circ$. As the sky was hazy this path may be somewhat in error, and as at Bridgwater, the meteor soon disappeared behind a house, the observation there may not be trustworthy, and as the lines of flight were almost in exactly opposite directions no certain radiant can be determined. Mr. Townshend says that the duration was 7 seconds, and that the longest diameter of the brighter part and nucleus was not less than $30'$, and while falling it expanded, and, as it were, threw off incandescent globular portions from its upper surface.

DAYLIGHT METEOR OF DECEMBER 4.

Mr. J. E. Clark sends a note of a bright daylight meteor seen at $19^h 20^m$, December 3, by Mr. S. N. Baker, at Sibford Ferris, near Banbury, who states that he was facing almost exactly N., and saw a brilliant meteor of a silvery blue colour issuing from a clear space in the sky at an altitude of about 45° , and falling perpendicularly to within 15° of the horizon. The duration was about 3 seconds, and it left a long streak for a short time. The speed was slow at first, but quicker towards the end of its course.

In concluding this portion of the Report, the Director wishes to acknowledge the courtesy of Mr. Denning in allowing him to make use of the interesting calculations of the heights and real paths of the meteors here set forth.

Concluding Remarks.

The Meteoric Section during the past 12 months has consisted of almost the same Members as were given in the list in the last Report, but recently Mr. D. Booth has resigned his membership, and we regret the loss by death of Mr. F. H. Ferrington. Mr. H. J. Townshend, of Leeds, has joined the Section, and a few others have kindly sent in their observations, and the Director will take this opportunity of thanking all who have assisted him in the past, and asking the help of others interested in the work, and also for any chance observations of fire-balls or other meteors made by those who are not members of the Section, but which

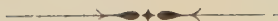
may often help in working out the real path or the radiant of a meteor.

The year 1894 has been remarkable for some very fine fire-balls, some of them even visible in broad daylight, and now that so much interest is taken in astronomy a good many useful observations have been collected of most of them.

In the observation of periodic meteor showers, however, we have been very unfortunate. Some have almost failed to put in any appearance whatever, and others have been almost entirely obscured by clouds or moonlight to a quite unusual extent, so that the list of reliable radiants is a small one.

Several Members of the Section are determined to do their best during the coming season, and it is hoped that the weather will be more propitious, and that every month preconcerted watches may be kept, not only for the chief showers, but for stray shooting stars on other nights.

HENRY CORDER,
Director of the Section.



SECTION FOR THE OBSERVATION OF J U P I T E R.

DIRECTOR.—REV. W. R. WAUGH, F.R.A.S.

FOURTH REPORT OF THE SECTION.

REPORT FOR THE APPARITION OF 1894 AND 1895.

PART 1.

The following Table gives the names of the registered Members of the Section; the localities of observation; the number of drawings forwarded to the Director; the inclusive dates of the drawings; and the instruments used.

TABLE I.

Names.	Locality.	No. of Drawings.	Instrument.	Inclusive Dates.
E. M. ANTONIADI -	Paris -	5	4½-in., 9¾-in. O.G.	Aug. 31, 1894; Oct. 28, 1894.
Rev. J. BAIKIE -	Anerum -	—	—	—
L. BRENNER -	Lussinpiccolo -	29	7-in. O.G.	Sept. 21, 1894; Feb. 23, 1895.
G. L. BROWN -	Stirling -	—	—	—
L. J. BROWN -	London -	—	—	—
R. W. BUTTEMER -	Godalming -	—	—	—
B. E. CAMMELL, F.R.A.S. -	Wokingham -	2	12½-in. spec.	—
E. J. COPE -	West Malvern -	3	8½-in. spec.	Nov. 21, 1894; Nov. 30, 1894.
H. CORDER -	Bridgewater -	18	6½-in. spec.	Oct. 24, 1894; Mar. 28, 1895.
A. COTTAM, F.R.A.S. -	Watford -	—	—	—
Rev. Dr. CRAIG, F.R.A.S. -	Londonderry -	—	—	—

Names.	Locality.	No. of Drawings.	Instrument.	Inclusive Dates.
R. CROSS	Oxford	—	—	—
G. T. DAVIS	Reading	8	3 $\frac{3}{4}$ -in. O.G.	Nov. 19, 1894; Mar. 22, 1895.
H. ELLIS	Potter's Bar	7	6-in. O.G.	Dec. 19, 1894; Jan. 23, 1895.
E. ESSAM	Billingborough	8	8 $\frac{1}{2}$ -in. spec.	Nov. 15, 1894; Feb. 17, 1895.
J. EVERSHED, F.R.A.S.	Kenley	—	—	—
Rev. T. H. FOULKES, M.A.	Devonport	21	10 $\frac{1}{2}$ -in. spec.	Dec. 16, 1894; Apr. 1, 1895.
A. FREEMAN	Hastings	—	—	—
W. GOODACRE, F.R.A.S.	Crouch End	7	12 $\frac{1}{2}$ -in. spec.	Jan. 26, 1895; Mar. 1, 1895.
G. P. B. HALLOWES, F.R.A.S.	Brough	1	8 $\frac{1}{2}$ -in. spec.	April 14, 1895.
A. HENDERSON	Liverpool	18	10 $\frac{1}{2}$ -in. spec.	Sept. 8, 1894; May 10, 1895.
E. R. HICKS	Kensington	—	—	—
Rev. R. S. HUTCHINGS, F.R.A.S.	Alderbury	—	—	—
W. H. IZZARD	Brentford	—	—	—
J. JACKSON	Blackpool	—	—	—
W. E. JACKSON, F.R.A.S.	Constantinople	—	—	—
Rev. S. J. JOHNSON, F.R.A.S.	Melplash	—	—	—
Rev. P. H. KEMP THORNE, F.R.A.S.	Wellington College.	2	10 $\frac{1}{2}$ -in. spec.	Jan. 21, 1895; Jan. 25, 1895.
H. MAC EWEN, F.R.A.S.	Glasgow	2	5-in. O.G.	Sept. 13, 1894; Apr. 14, 1895.
Dr. MAINS	Portland	—	—	—
W. H. MAW, F.R.A.S.	Kensington	3	6-in. O.G.	Dec. 12, 1894; Dec. 19, 1894.
J. W. MEARES, F.R.A.S.	Brighton	6	3-in. O.G.	Sept. —, 1894; Feb. 25, 1894.
A. MEE, F.R.A.S.	Cardiff	15	8 $\frac{1}{2}$ -in. spec.	Nov. 18, 1894; Mar. 31, 1894.
Lieut. P. B. MOLESWORTH	Hong Kong	8	9 $\frac{3}{4}$ -in. spec.	Jan. 6, 1894; Jan. 29, 1894.
J. M. OFFORD, F.R.Met.S.	Ealing	2	12 $\frac{1}{4}$ -in. spec.	Apr. 1, 1895; Apr. 9, 1895.
Dr. G. PATTERSON	Ascot	32	11-in. spec.	Nov. 11, 1894; Apr. 1, 1895.
J. PHILLIPS	Hereford	4	15 $\frac{1}{4}$ -in. spec.	Jan. 5, 1895; Feb. 16, 1895.
Rev. V. REID	Glasgow	—	—	—
C. ROBERTS, F.R.A.S.	Bournemouth	72	6 $\frac{1}{2}$ -in. spec.	Aug. 25, 1894; May 10, 1895.
Dr. R. J. RYLE, M.A.	Hadley	—	—	—
Rev. E. SAUL	Weston-super-Mare.	4	10-in. spec.	—
W. C. STEWART	York	1	—	Sept. 11, 1894.
Dr. SMART, F.R.A.S.	Bernon dsey	1	10 $\frac{1}{4}$ -in. spec.	Jan. 18, 1895.
C. A. TAYLOR	Kensington	4	2 $\frac{1}{2}$ -in. spec.	—
Rev. J. H. TUCKFIELD	Tasmania	—	—	—
Rev. W. R. WAUGH, F.R.A.S.	Portland	28	4 $\frac{1}{2}$ -in. O.G., 12-in. spec.	Oct. 8, 1894; Mar. 28, 1895.
A. STANLEY WILLIAMS	Brighton	—	—	—
Rev. L. A. WILLIAMS	Brighton	—	—	—
W. H. WOOSTER	Ballarat	—	—	—

Names.	Locality.	No. of Drawings.	Instrument.	Inclusive Dates.
J. WYKES	Bournbrook	12	4½-in. O.G.	Dec. 12, 1894; Apr. 14, 1895.
H. F. GRIFFITHS	Streatham	—	6½-in. spec.	—
E. W. ELLERBECK	Scarborough	—	5-in. refrac.	—
JOS. LUNT, B.Sc.	Ealing	—	3½-in. refrac.	—
RALPH FALCON	Workington	—	3½-in. refrac.	—
N. LATTEY	Cardiff	—	8½-in. spec.	—
F. K. MELLOR	Huddersfield	—	5-in. refrac.	—
J. ORR	Glasgow	—	3½-in. refrac.	—
WM. ANDERSON	Madeira	—	5-in. spec.	—
ED. HALL	Finland	—	5-in. spec.	—
Total		324		
Extra drawings		27		
Total		351		

In this table we have accounted for all the drawings that have come to hand during the apparition. Some of these have been published in the "Journal" of the Session; others sent to the New South Wales Branch. A few have been detained for special use or reasons, but not those for cyclical purposes, and will be accounted for in due course.

A few of the drawings are in black and white to suit the Collotype process of reproduction, should the Council adopt it. It is, however, but fair to say that nearly all the Members very much prefer Mr. Green's forms, and that reproductions, if less numerous, should be tinted. The total number of finished drawings on Green's forms is 272. The number on paper or card, inclusive of charts and separate markings, is 86, making a total of 358 drawings of all kinds for the apparition, a number which indicates an amount of application to work which is very satisfactory to all concerned. It is thought that the general character and artistic quality of the drawings have advanced, and also that the accuracy of the delineations will bear comparison with previous efforts. Nearly all the drawings have been tested in this respect. The latitude of the belts has been specially attended to.

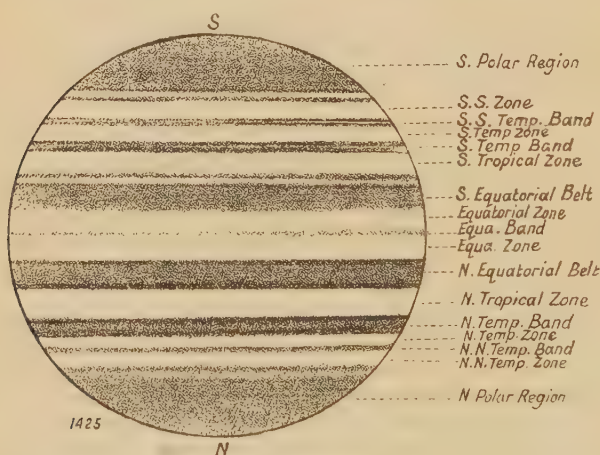
The longitude of important markings, and of the central meridian is fairly correct in nearly every case, and has been generally computed by the observers themselves.

The interim reports that have frequently appeared in the "Journal" really form an integral portion of this Memoir, and should be read in connexion with it. As heretofore these occasional notes have been found stimulating and guiding to co-workers. The Director has never before known so many and prolonged climatic hindrances occurring as when Jupiter was most accessible

for observation, and yet the amount of work done and the number of observers have exceeded that of previous years. The total number of good nights when the planet was nearest opposition (viz., in October to February) was only 33, of which 10 were in December, and these five months include the prolonged frost. These climatic hindrances referred to are chiefly to counsel observers to avail themselves of the earlier months of the apparition, and, if circumstances permit, of the early hours of the morning, when the air is generally at its steadiest.

We are glad to know that the adopted terminology has been invariably used by the Members of the Section, and that it has been approved by experts outside the Section. It is hoped that it will one day become universal.

To assist in making the names still more definite, the diagram is reproduced here, and it may be remarked that the latitude of the belts and bands is fairly well preserved, making allowance for a slight but well ascertained shifting.



The Members of the Section desire again to express their deep indebtedness to Dr. Marth for his invaluable Ephemerides. They also desire to express their acknowledgment of service rendered to the Section by Mr. A. Stanley Williams, whose great experience has been laid under contribution from time to time. Encouraging words have come to hand from eminent astronomers at home and abroad, showing that the work of the Section is not unappreciated. For such friendly notice the Section is grateful.

To the 50 members of the Section the Director cannot but present his cordial thanks at once for their hearty co-operation and forbearance; some of the more active have literally overwhelmed him with communications and interrogations, the latter not always purely sectional. Some seem to have thought that a Director must be an encyclopedia of reference in all departments of astronomy. The Director has always endeavoured to reply, or

has referred them to those who could, believing that mutual correspondence is a bond of strength.

Some sectional papers have been read at the Branch Meetings of the Association; notably one "On the Observation of Jupiter," intended chiefly as a message of friendly interest to the Jovian students in the New South Wales Branch. It is hoped that, while promoting local activity, it will cement the union with the parent association, and will possibly lead to the sending of similar return messages.

Three small portfolios of drawings have been circulated, one being specially designed for the use of the English Branches. It is believed they do more than satisfy curiosity as to what others are doing, being instructive and stimulating.

The Director has arranged, according to longitude, nearly the whole of the drawings to hand in a suitable album. They will be deposited in the Library for future reference, and it is intended that the same should be done for the drawings of the four previous apparitions. Facilities for their study will doubtless be afforded by the librarian. Captain Wm. Noble's suggestion of the probable cyclical motion of the Jovian markings is on the eve of being fully discussed, and though it will necessarily take considerable time, it is hoped that the Jupiter Section of the British Astronomical Association will take a fair share in the work.

As in previous memoirs, Part I. is preliminary and an outline of work achieved. Part II. is a condensed description of work and include the manuscripts of some of those Members who have presented their returns in a collected form. As many of the Members have only been able to indicate their work in letters and postcards, this disjointed form could only appear in the condensed results. Part III., as heretofore, is a tabular statement of satellite returns, happily somewhat more copious than on previous occasions, though still rather disappointing in quantity. It is hoped, however, that there is evinced increasing care and accuracy. Part IV. is the usual résumé of the more important observations of the Section, with brief remarks on the same.

In these four parts it is felt that the veriest outskirts of Jovian knowledge have only been reached, that what lies beyond present grasp is the immensely larger portion of the subject; nevertheless, what has been done is our acquired standpoint for further discoveries. The real need of Jovian students at present, is a comprehensive work on the planet corresponding in style of treatment with that of the now classical work of M. Flammarion on "La Planete Mars." It is hoped that the French astronomer, or some one who is fully competent, will undertake this task, and if the Jupiter Section of the British Astronomical Association can in any way aid in the production of the monograph it will not have existed in vain. Should any Member of the Section be moved in this direction, the Director will be glad to act as the temporary recipient of data, papers, or drawings.

The Rev. T. H. Foulkes, one of the most diligent and successful sectional workers, has suggested the desirability of any given

observer paying special attention to a certain portion of the disk, in addition to the more general delineation. The Director does not see this to be an over-refinement of the division of labour. But what may be regarded as the outlying and less noticed portions of the disk should not be neglected in the individual selection, as they are more likely to afford perfectly new discoveries. Any supposed new feature should be at once submitted to the Section for corroboration, and the Director, as a rule, should know what portion of the disk is made a *spécialité*. The Polar regions have been too often relegated to later times of observation, and are often slurred over as presenting usually a blank aspect. These portions are, however, full of interest, as several of the drawings during the late apparition abundantly show; some of these features will be specified in Part II.

At a Meeting of the Association held on April 24, 1895 a series of 15 lantern slides representing an entire rotation of Jupiter's surface was exhibited by the Treasurer. The slides were prepared from drawings of the planet taken by Herr Brenner at the Manora Observatory. On May the 29th there was exhibited, at the close of the Meeting, by Mr. G. T. Davis, 70 beautiful drawings on Mr. Green's forms, as taken by Herr Brenner during the apparition, and showing nearly all the features of interest seen in 1894-95. This exhaustive series of Jovian sketches is especially noteworthy as exhibited by a Member of the Section, whose patient skill and diligence is exemplary, an example (the Director is pleased to add) not without fruit in the returns from several of the other Members, and stimulative of yet future work.

PART 2.

The most notable features of the apparition are, in brief, as follows: Discussion of these and other features will be found in Part IV. :—

- 1st. The partial revival of the Great Red Spot.
- 2nd. The two equatorial belts have been unusually agitated during the whole apparition.
- 3rd. The equatorial zone has been fertile in changes.
- 4th. The two temperate bands have been comparatively quiescent.
- 5th. The Polar regions have not been without interest.

The N. Polar regions have generally presented the usual bluish tint.

The S. Polar region has been darker than usual, occasionally nearly as dark as the N. It has also shown a ringed appearance similar to the northern.

As in previous "Memoirs" the surface has been divided into six sections for the sake of comparison; each section comprises 60° of longitude, that is, the distance each side of the central meridian will be about 30° , as such an arrangement fairly avoids the distortions incident to curvature of surface. Reference to

the "Memoirs" for 1891 and 1892 will explain this fully. Change in the latitude of the belts is clearly established.

These changes should be carefully noted with a view to discover the cause. It is a well-known fact that the spots and other markings do not rotate uniformly, and by noting the changes in latitude conjointly with the periods of the spots, discoveries may possibly be made. The shifting of the temperate belts is so manifest as to render eye observations useful, and Slade's micrometer, a cheap and easily used apparatus, may be profitably employed in this work.

As heretofore in the preparation of Table II., nearly the whole of the drawings have been utilised, about 350 in number. Drawings not reproduced in this Memoir will be inserted in the album. As before, certain drawings have been marked by the Director as suitable for reproduction from which the Council will make a selection.

It may be well to note that, as heretofore, the longitudes have been computed according to Marth's tables, System II., and that this year the Director's labour in computation has been very light, as compared with previous occasions, as many of the workers have computed their own latitudes.

The Director recommends the excellent manual by Messrs. Barlow and Bryan in the University Tutorial Series, entitled "Elementary Mathematical Astronomy," published by Clive and Co., of Booksellers Row, London. Such a book should be fairly mastered by all planetary observers. It is believed that the great majority of Jovian students are anxious to be thorough.

Photographs taken at the telescope only bear enlargement when the aperture is very considerable, and as a clock movement is indispensable as well as a high class enlarging camera, it is scarcely to be expected that the Section will employ the camera at the telescope; but the copying of very careful and unusually interesting drawings will not only multiply copies for friends, or other societies, but certainly induce and cultivate that habit of accuracy so essential to observational success.

In the present list of drawings the range is from August 25, 1894, to May 10, 1895.

As will be perceived, the arrangement is the same as previous Memoirs.

Section I., longitude 0° to 60° .—There are 60 drawings in this Section; 42 drawings are wholly available for comparison, making, of course, allowance for diversities of dates, of apertures, and powers used, and of those varieties of draughtsmanship which must always characterise diverse observers; 37 of these drawings show more or less distinctly the Great Red Spot. It is shown in several quite plainly near the limb, indicating very favourable seeing conditions. In several drawings the ringed aspect and the darker following end is shown. "The shoulder is plainly shown in all the drawings, and as in former years its angle with the belt varies. This is thought to be a proof of variability in this feature, though it may still be said that there is no more permanent one on the disk. The ligament uniting the Red Spot with the shoulder is not shown in any of the sketches

"except two by Mr. Henderson, though features of equal delicacy are indicated. There is, however, no doubt of its existence. Nearly all the charts hitherto inspected by the Director include it. This points to variability in this thread-like feature. It is vain to look for it except in the very best seeing conditions." In 32 drawings the faint equatorial belt is shown, justifying the belief that it is plainer this apparition than during recent ones. The light and dark markings in the equatorial zone are more numerous and distinctly shown than heretofore. The drawings of Herr Brenner, Dr. Paterson, Messrs. Henderson and Roberts are noteworthy for this. The disturbed condition of the N. equatorial belt is plainly shown in every sketch; in some it is very pronounced. It should be noted that as Mr. Roberts uses a Herschelien reflector, the disk is represented as reversed, but not inverted. A noteworthy drawing in this section is the one by Mr. Henderson above referred to.

Section II., longitudes 61° to 120° . There are 47 drawings in this section. The faint equatorial belt is shown in 31 sketches. The delicate wisps are shown in drawings by Messrs. Roberts and Henderson. The white markings and mottling on the equatorial zone are shown in nearly all in this section. The disturbances in the two equatorial belts are shown in all, especially by Messrs. Paterson, Henderson, Foulkes, Brenner, Hallows, and the Director. The delicate rifts in both belts are plainly shown by Herr Brenner, Messrs. Corder and Mee. The N. temperate band is very plain in nearly all the drawings, and in nearly every case is shown in a quiescent condition. Its greenish tinge is seen in several sketches. The Polar regions are normal, Dr. Paterson showing the tints very strongly.

Section III., longitudes 121° to 180° .—This section comprises 43 drawings. The faint equatorial belt is shown in all. The delicate wisps are seen in drawings by Messrs. Antoniadi, Roberts, Molesworth, and Paterson. The disturbed condition of the N. equatorial belt is well shown by Messrs. Corder, Davis, Brenner, the Director, and others. The rifts in the S. equatorial belt are shown by the same observers. The forked appearance of the same belt is shown in several of the drawings. The temperate bands are normal, as in previous section. Several light spots are seen on the S. temperate band in drawings by Herr. Brenner, Messrs. Paterson, Roberts, and the Director. The ringed aspect of the N. Polar regions is shown in drawings by Messrs. Goodacre, Mee, Davis, and Wykes. A dark marking is shown in the N. Polar regions by Lieut. Molesworth. Mr. Mee shows two striking red spots, N. edge of N. equatorial belt, in longitude $\pm 140^{\circ}$. A rift in a drawing by Mr. Goodacre in the same belt in drawing No. 158 is very unusual in form.

Section IV. comprises drawings whose central meridians range from 181° to 243° . There are 44 drawings in this section, in which the following are perhaps the most striking features. The equatorial zone is fairly well shown, especially in sketches by Messrs. Henderson, Paterson, Roberts, &c. The latter showing the wisps in drawing 232. Messrs. Saul and Antoniadi also show these delicate features. The faint equatorial belt is shown in all.

The reason for dwelling on this zone is that it shows the seeing must be excellent, and the other features in the sketch are probably unusually good and accurate. The disturbed condition of both equatorial belts is shown in nearly all the drawings; in a marked manner by Messrs. Foulkes, Cope, Brenner, Paterson, Roberts, Antoniadi, Ellis, Henderson, Corder, Saul, the Director, &c. The temperate bands are comparatively undisturbed, Herr Brenner, however, shows peculiar dark markings on the N. temperate band in longitude 186° . A striking feature in this section is a red longitudinal belt on the N. tropical zone, in a drawing by Rev. T. H. Foulkes (longitude of central meridian 239°), and the divided and curved aspects of the S. temperate band in the same drawing. This additional quasi band is corroborated as to form and position in drawings by Messrs. Paterson and Roberts. The Director has several times suspected it. On the N.N. temperate band Herr Brenner shows dark markings in drawing No. 163. The colouring and the ringed aspect of the N. Polar regions is shown in eight drawings. The rings on S. Polar regions are also shown in six drawings.

Section V. comprises 42 drawings ranging in longitude from 241° to 300° . Messrs. Offord, Paterson, Roberts, Corder, Cammell, Ellis, Henderson, and Molesworth show the mottling on the equatorial zone. The delicate equatorial belt is shown in all, especially by Messrs. Cammell and Foulkes. The disturbances in the N. and S. equatorial belts are shown in nearly every drawing, Messrs. Maw, Paterson, Foulkes, Henderson, Mee, Molesworth, Corder show white spots or rifts in both belts. The temperate belts are plainly shown. Light spots are shown on the Polar regions in sketches by Dr. Paterson. Noteworthy drawings by Rev. T. H. Foulkes, especially one in long. 260° , show three transverse rifts on the N. equatorial belt, two being accompanied by dark markings. The drawing by Mr. Goodacre (long. 286°) shows a curious rift on the S. equatorial belt. The sketch by Dr. Paterson (long. 294°) is a most remarkable one, showing, as it does, with great minuteness the disturbances in the N. equatorial belt. Mr. Saul's drawing, long. 248° , is similar. Mr. Henderson's drawing, long. 261° , is a striking one.

Section VI. includes longitudes 301° to 360° . In this section the Red Spot is shown in 20 drawings, and the shoulder formation in nearly all. The delicate equatorial belt is shown by Messrs. Brenner, Roberts, Mee, Henderson, Ellis, Foulkes, and the Director. The light markings are well shown in the drawings by Herr Brenner, and Roberts. The dark wisps are well shown in drawings by the latter, a fair specimen being seen in sketch, long. 356° . The N. and S. equatorial belts are shown rifted and much disturbed, large white spots or markings being shown in drawings by Messrs. Corder, Foulkes and others. The temperate bands are fairly well shown in nearly all the drawings, notably by Foulkes, Henderson, Goodacre, Davis, Brenner, Antoniadi, Mee, and Ellis, &c., the latter showing a singular curve in long. 333° . There is a noteworthy drawing by Mr. Corder (long. 350°) showing an unusually large white marking on the N. equatorial belt. Mr. Wykes shows some singular markings connecting the N. equatorial belt with the N. temperate band, long. 354° . The

drawing by Mr. Wykes (long. 355°) of a later date shows striking markings on the N. equatorial belt. Those by Mr. Corder (long. 360°) and by Mr. Goodacre (long. 309°) are also noteworthy.

The supplementary drawings consist chiefly of 27 black and white sketches by Herr Brenner. They are the originals of those which appeared in the *E.M.* The faint equatorial belt is shown in every drawing and the wisps in nine of them. The series bore the testing for accuracy in latitude remarkably well, especially as position was obtained by eye estimates.

The following is a description of 21 drawings selected as representative of the work of the Section. The descriptions are as nearly as possible in the language of the Members. To describe the whole 350 would be far beyond printing limits. Where the returns have been carefully arranged, and are in presentable form, they will be sent to the Library with the MS. of the Memoir. The data which has come to hand in desultory form is retained by the Director for the present.

Long. 0° (Waugh).—The Red Spot clearly shown, the preceding end being very diffuse. The shoulder sharply curved, and the following end of the S. equatorial belt duplex. The N. equatorial belt deeply indented on its S. edge.

Long. 19° (Henderson).—The most notable features in this drawing are the Red Spot, seen darker on its S. and E. boundaries, and the delicate ligaments joining the Red Spot to the S. equatorial belt. The duplicity of this belt is well seen, the southern portion being the darker. The N. equatorial belt is seen much disturbed, with singular light rifts on the northern edge. The ringed aspect of the Polar regions is very marked.

Long. 21° (Antoniadi).—The Red spot and its aureola distinctly seen. Four dark spots attached to the N. edge of the S. equatorial belt. The N. equatorial belt much disturbed.

Long. 23° (G. T. Davis).—Two marked white spots are seen in the equatorial zone. The Red Spot is well defined. The N. equatorial belt is disturbed. Two very decided dark spots being shown on its N. edge.

Long. 32° (Waugh).—The Red Spot, definite at the following end, is clearly seen. The shoulder is dark and well defined. Both equatorial belts are duplex; on the N. edge of the N. belt there are several dark spots interspersed with white ones. The faint equatorial belt is well seen. The N. temperate band had a greenish tinge. The N. Polar regions are plainly ringed; air good.

Long. 36° (Maw).—Red Spot very plain at following end. The shoulder very definite. The faint equatorial belt well seen. The N. equatorial belt had a peculiar angular marking that seemed to spring from a dark spot on the N. edge, and reach the S. edge. Four white spots are seen on the N. edge. The N. temperate belt is definite, and the ringed aspect of the N. Polar region is well seen. The shadow of Sat. I. is shown in transit.

Long. 89° (Mee).—The faint equatorial belt shown. Dark spots on N. edges of the equatorial belts. The S. and N. temperate bands clearly shown.

- Long. 102° (Davis).*—The N. edge of the N. equatorial belt seem disturbed. Four dark well-defined spots on it. The N. temperate band dark and distinct.
- Long. 104° (Paterson).*—The faint equatorial belt seen from limb to limb. The S. equatorial belt much disturbed. A curious light spot surrounded with dark extensions from the body of the belt. Several other light markings on the belt. The N. equatorial much disturbed. A wavy light marking at the following end, and four prominent dark spots on the N. edge. The N. temperate band very distinct; its N. edge being irregular. The N.N. and S.S. temperate bands seen. A very striking drawing.
- Long. 195° (Kempthorne).*—Both equatorial belts much disturbed. Four white spots on the N. edge of the N. equatorial belt.
- Long. 227° (Davis).*—The copperish tint seen in both equatorial belts. On the N. edge of the N. equatorial belt were seen three dark spots reaching the N. temperate band.
- Long. 261° (Henderson).*—A drawing very full of detail. Three light wisps on the equatorial zone. Also the delicate equatorial belt. The S. equatorial belt duplex in preceding part. Wavy in outline, with dark markings. The N. belt copper coloured and spotted with dark and light spots, over 14 in all. A dark marking on the S. temperate band, S.S. and N.N. temperate bands.
- Long. 269° (Roberts).*—Dark spots on the N. edge of the S. equatorial belt, which is seen duplex. The N. equatorial belt much disturbed. A light spot on the equatorial zone, also a large one on the preceding portion of the N. tropical zone. Both temperate bands plainly shown.
- Long. 282° (Henderson).*—A serrated line on the N. edge of the S. equatorial belt, very delicate. The N. equatorial had a shaded aspect, with light spots on N. edge. The temperate bands seen. The Polar regions bounded.
- Long. 309° (Goodacre).*—Bifurcation of the S. equatorial belt well seen. Also an extension below the fork. The N. belt is seen disturbed, with light and dark markings on it. The two temperate belts well seen. Polar regions dense.
- Long. 318° (Antoniadi).*—The Red Spot clearly seen, The shoulder well marked and high. The S. equatorial belt divided in preceding part. Three dark spots on N. edge with two wisps extending from them. The N. equatorial belt very disturbed, with spots extending from it on the N. tropical zone. A large white spot on the preceding portion. The two temperate bands seen.
- Long. 330° (Saul).*—Both equatorial belts dense, with light markings. The equatorial zone mottled, two definite light spots. Both temperate bands well seen. Also the N.N. temperate band well seen. S. Polar region dense.
- Long. 334° (Henderson).*—The Red Spot seen with a portion of the trail. The equatorial zone mottled with definite light markings. The delicate faint equatorial belt seen. The N. equatorial showing some singular dark markings along the S. edge. The S. Polar region well seen.

Long. 337° (Waugh).—The Red Spot shown. Also the shoulder, sharply curved, and the faint equatorial belt shown. The N. equatorial belt much disturbed with light spots on the S. edge, and dark spots on the N. one. The N. and S. temperate bands well shown.

Long. 337° (Wykes).—The equatorial belts shown, with dark spots and wavy markings. The N. and S. temperate belts shown. The S. Polar region darker than the N., an unusual feature, shown in a few of the unpublished drawings.

The above 21 drawings are only specimens of the work done. The remainder of the over 350 drawings is well worth study and description, most of them being full of interesting detail.

The following is a brief description of charts sent in:—

Mr. Henderson sends a full chart of Jupiter as obtained by observations in 1894 and 1895. It shows the equatorial belt as somewhat deviating from the equator of the planet, being several degrees N. at its preceding portion. The latitude of this belt, as obtained by averages, is $2^{\circ} 1'$ S. Seventeen large white markings are shown N. of the equator and 21 S. of the equator. It is difficult to define the exact number of wisps, but there are about 12 of these delicate features. The S. equatorial belt is shown duplex in its entire length, with two rifts reaching each edge. There are about nine dark markings on the N. edge, partly merging into each other, and two on the S. edge. There are also two light markings on the same edge. The Red Spot is shown very definitely, the zero longitude being about its centre. The S. temperate band has two dark spots, and in its preceding portion has nine white spots on its surface. They range from long. 230° to near 340° (a feature of great interest). The N. equatorial belt has one large dark spot near the zero meridian. Also a similar one in long. 120° . The other dark markings are chiefly on the N. edge of the belt, and merge into each other. The dense marking in long. 130° — $160^{\circ} \pm$ is shown on most of the drawings, and was a marked feature of the apparition. There is a rift through the belt in long. $350^{\circ} \pm$. This also was much observed. There are 22 light spots on the N. edge of this belt. The N. temperate band is shown irregular, with markings. The labour connected with the construction of this chart was amply rewarded by greatly increased power and grasp over the planet's disk. It is hoped the example will be followed with the addition of latitude graduation.

Herr Brenner sends a chart of the entire visible surface. The faint equatorial belt is shown to increase in S. latitude at its following end, with a darker marking in long. 295° — 310° . The Great Red Spot is shown with its centre at about 5° . There is a long rift on the S. equatorial belt, extending from long. 185° — 261° . The forked portion of the belt extends from 272° — 348° . Another rift extends from 12° — 90° , dividing the shoulder, which is unusual. Another rift extends from 140° — 188° . There are nine dark spots on the N. edge of the belt, and seven light ones in addition to the mouths of the rift. There are 12 light spots on the equatorial zone, and a few dark shades. On the

N. equatorial belt there are six short rifts, and nine dark spots, and 11 light ones. On the N. temperate band eight light spots and some dark markings. The two S.S. and N.N. temperate bands are shown, with two spots on the former. The light marking shown by dotted lines on the N. edge of the N.N. temperate band is unusual, but the most marked feature are the conical and square large dark masses on the N. and S. Polar regions. The former has been frequently seen by other observers.

It is hoped that Herr Brenner's zeal and industry in chart marking will stimulate all the Members of the Section to follow suit. While requiring care in fixing the longitudes it is not so difficult as appears at first sight.

Mr. Roberts sends a chart of the entire disk from observations between the 10th to the 28th of April 1895. It shows 19 wisps and four broader markings proceeding from equatorial belt to equatorial belt. Also 19 light spots or markings, and the faint equatorial belt on the equatorial zone. A truly wonderful collection of objects. The S. equatorial belt is duplex almost throughout its entire length. The duplicity being interrupted N. of the Red Spot and four other places by light markings. There are 19 dark spots on the N. edge, and five, more or less distinct, on the S. edge of the belt. The Red Spot is shown with its centre on the zero meridian. On the N. edge of the N. equatorial belt there are 21 light spots and 18 dark spots. The S. tropical zone has 14 light spots or markings, and the S. temperate band has seven dark markings. The S. temperate zone four white markings with traces of others. The N. temperate band has seven dark spots or markings. There is one light marking on the S. Polar region.

PART 3.

SATELLITE OBSERVATIONS.

The returns in this department of Jovian work, though somewhat more copious than heretofore, are still below the requirements of its importance. An indicated time, if doubtful, is of little scientific value. Meanwhile the approximation attained by a quadrant, a good watch, and the aid of the nearest post office clock, when carefully used, is not altogether valueless, and is certainly a good training in accuracy. The observations of Callisto, as suggested by Dr. Downing, have again been excellent practice in this class of observing, and the mean results are interesting and possibly a basis for calculating purposes. The observation of relative albedo and colouring has been going on, and the ultimate results will be of value. The following tabular statements are selected of a highly trustworthy nature. The Director purposes for the apparition of 1895-96 to furnish forms based on those in use among acknowledged experts in which the fading and extinction in satellite eclipses, the external bisection and internal contacts will be indicated in occultations and transits, and remarks on any peculiarities during observation may be given. The best qualified observers in the

Section are quite prepared for this order of work, so it is hoped that the apparition of 1895 and 1896 will afford useful data for computation.

The form of satellite No. I. having been set at rest by the masterly observations of Prof. Barnard, supposed oblateness will no longer be a subject of inquiry in the Section. Barnard's published measures of size have practically taken out of the hands of amateurs that and kindred subjects, leaving, however, eye estimates of albedo and tint within range. Observers are again referred to the excellent paper on satellite observation by Dr. Downing, written mainly for the instruction of Members of the Jovian Section, and printed in the "Journal," for November 1890. Recent Members of the Association who contemplate satellite work should make the article their *vade mecum*.

The Rev. S. J. Johnson's paper is given intact. His expertness and experience entitling him to the foremost place in this department. It is as follows:—

"The sharp weather that prevailed in the early months of 1895 was favourable for observation. The occultation of the Pleiades on the 7th of January, and the total eclipse of the moon on the 11th of March being seen without an intervening cloud. In the following list of eclipses of Jupiter's satellites, poor observations are omitted.

"1894.—October 26. Satellite I. Eclipse D. Fading
11^h 50^m 20^s. Disappeared 11^h 51^m 42^s.

"December 4. Satellite I. Eclipse D. Fading
10^h 17^m 23^s. Disappeared 10^h 18^m 8^s.

"1895.—January 5. Satellite I. Eclipse R. First perceptible 9^h 6^m 10^s. Bright 9^h 7^m 37^s.

"January 7. Satellite III. Eclipse R. First visibility 7^h 45^m 11^s. Bright 7^h 47^m 56^s.

"January 11. Satellite II. Eclipse R. First visibility 8^h 48^m 59^s. Bright 8^h 51^m 2^s.

"January 28. Satellite I. Eclipse R. First glimpse 9^h 21^m 13^s. Bright 9^h 22^m 55^s.

"February 4. Satellite I. Eclipse R. First glimpse 11^h 16^m 21^s. Bright 11^h 17^m 33^s.

"February 5. Satellite II. Eclipse R. First seen 5^h 52^m. Bright 5^h 53^m 4^s.

"February 6. Satellite I. Eclipse R. First glimpse 5^h 45^m 9^s. Bright 5^h 46^m 20^s.

"February 12. Satellite II. Eclipse R. First glimpse 8^h 27^m 12^s. Bright 8^h 28^m 44^s.

"February 13. Satellite I. Eclipse R. First glimpse 7^h 41^m 5^s. Bright 7^h 42^m 19^s.

"February 19. Satellite III. Eclipse R. First glimpse 7^h 54^m 2^s. Bright 7^h 55^m 39^s.

"Satellites then arranged in a triangle:—

"February 19. Satellite II. Eclipse R. First glimpse 11^h 2^m 43^s. Bright 11^h 4^m 8^s.

"February 20. Satellite I. Eclipse R. First glimpse 9^h 36^m 45^s. Bright 9^h 38^m 56^s.

"April 7. Satellite I. Eclipse R. First glimpse 10^h 9^m 34^s. Bright 10^h 12^m 5^s.

"On January 4th made a near approach to γ Geminorum. The star seemed 1 mag. brighter than his third satellite. I examined the distances of these two or three times during clear intervals at $10^h 27^m$, they were about $60''$ apart. On the 5th the same star was just N. of the second satellite, at $9^h 15^m$ by micrometer, it was $48''$ off. Its reddish tinge caused a noticeable contrast of colour."

Lieut. Molesworth returns as follows:—

Time taken by seconds watch corrected to town time (Hong Kong) at the nearest hour. These are therefore chiefly interesting, *inter se*.

1895.—Transit of Satellite II. January 6. Shadow on central meridian $6^h 43^m$. Satellite first visible on disk $7^h 11^m 30^s$. Internal contact, 1st, $7^h 16^m 20^s$. Satellite obviously against sky $7^h 18^m$. Half off $7^h 20^m 55^s$. External contact $7^h 23^m 10^s$. Clear black division between limb of \mathcal{U} appearing slightly flattened $7^h 25^m 20^s$.

I thought in several cases I saw a penumbra to the shadow, but could not be certain as the definition would only allow of a power of 225.

1895.—January 8. Transit of Satellite I. 1st contact with limb $5^h 52^m 40^s$. All on disk $5^h 55^m 10^s$. Shadow, 1st contact $6^h 17^m 10^s$. All on disk $6^h 19^m 30^s$. Satellite on central meridian $\pm 6^h 56^m$. Shadow on central meridian $7^h 18^m$.

Shadow intensely black and seemingly larger than the satellite. Satellite only visible with difficulty from $6^h 45^m$ to $7^h 8^m$, as it was on a lighter portion of the disk. Easily seen the rest of the time. Egress not seen.

1895.—January 23. Occultation of Satellite I. Approximately one diameter from the limb $6^h 24^m 30^s$. First contact $6^h 28^m 40^s$. Satellite vanished $6^h 32^m 30^s$.

Satellite appeared very bright, almost phosphorescent, in contrast with the dull limb of \mathcal{U} , disappearance watched with 450 e.p. under perfect definition. The limb of the planet could actually be seen against the bright satellite, and the appearance was most striking when the latter was half covered. Final disappearance took place as I moved the telescope (the slow motion being stiff), but was within 5 seconds of the time noted.

1895.—January 25. Transit of III. Definition poor, drifting clouds. Satellite three diameters from the limb, $2^h 17^m$, when clouds stopped further observation.

January 29. Occultation of II. Definition fair, 375 e.p. Satellite within one diameter of limb, $6^h 30^m 45^s$. First contact, $6^h 33^m 35^s$. Disappearance, $6^h 3^m 40^s$.

The colours of the satellites not noted as a rule. Speaking generally, IV. now appeared invariably the faintest (though the second in size of the four), and of a pale blue tinge. III. a great contrast in brightness, and of a very delicate pale yellow. $9\frac{1}{4}$ spec. used. Difference between Hong Kong and G.M.T. is $7^h 36^m 38^s$.

Mr. Ellis returns as follows:—

1895.—January 9. Satellite II. in transit. External contact, $10^h 17^s$. Internal contact, $10^h 24^m 30^s$.
Appeared brighter than bright parts of planet.

1895.—January 20. Satellite I. in transit. External contact, $7^h 18^m$. Internal contact, $7^h 28^m$. Internal contact exit, $9^h 30^m$. External contact exit, $9^h 38^m$. Shadow on C.M., $9^h 5^m$.

January 21. Satellite occultation. Disappearance, $10^h 10^m$.

February 2. Satellite IV. Superior conjunction, air not very steady, $10^h 52^m$. Satellite appeared to graze along the planet in contact, flattening the disk of irradiation, and being itself dimmed as though partly hidden by Jupiter's atmosphere.

Rev. T. H. Foulkes returns as follows:—

Time as given by my chronometer, from which I can get absolute G.M.T. We get a signal from Greenwich every day.

1895.—February 19. Satellite II. c. visible easily to $6^h 11^m$. Time given in *Companion*, $6^h 8^m$. Satellite III. eclipse re-appearance as in *Companion*, $7^h 55^m$. Seen plainly at $7^h 53^m$. Quite out of shadow by $7^h 54^m$. Satellite II. in transit. Satellite quite clear of disk, $5^h 38^m$. Shadow completely off disk, $5^h 37^m$.

In fact, I should say the satellite and shadow egress were practically simultaneous. A very pretty sight.

1895.—March 5. Satellite III., occultation disappearance, $7^h 56^m 4^s$.

April 10. Occultation re-appearance. Satellite III. First seen, $7^h 2^m 40^s$. Quite clear, $7^h 3^m$. Times given in *English Mechanic* and *Companion*, $7^h 7^m$.



A lovely sight at about $7^h 20^m$. IV. and III. on either side of the N. Polar regions at equal distances looking like bright beads suspended; noted the great disparity in size. III. much larger than IV., which seemed to decrease in apparent size in comparison, both moving westward.

Satellite IV. Occultation disappearance, $8^h 4^m$. Satellite IV. Occultation re-appearance, $9^h 42^m$. E.M. times, disappearance $7^h 55^m$, re-appearance $9^h 48^m$.

A slow weary movement, jog-trot compared with the dash of Satellites I. and II.

Mr. Meares reports as follows:—

1895.—February 19. II. Satellite. Occultation disappearance, about three quarters gone, $6^h 8^m 30^s$. Last glimpse, $6^h 10^m$. Satellite III. Eclipse reappearance, $7^h 54^m 56^s$. Satellite I. Transit ingress, $8^h 57^m 25^s$. Satellite II. Eclipse reappearance, $11^h 2^m 41^s$. Satellite I. Transit egress, bisected, $11^h 14^m$. Satellite I. Last contact, $11^h 16^m 35^s$. Satellite IV. Eclipse disappearance, $13^h 24^m$. Very gradual disappearance.

Mr. G. T. Davies returns as follows:—

1895.—January 21. Satellite III. Occultation. First contact, $9^h 59^m$. Total disappearance, $10^h 7^m$.

March 7, at $8^h 55^m$, observed the shadows of Satellites I. and II., one on the S. equatorial belt, the other on the S. equatorial zone, which appeared light grey. At times the satellite itself seemed a still fainter grey hue than the grey shadow.

March 16. The shadow of Satellite III. on S. temperate belt at 8^h above one-third of diameter from limb.

April 15. Satellite I. just off W. edge of disk at $8^h 14^m$, opposite N. edge of S. tropical zone, its shadow just past C.M. Satellite II. about its own diameter from limb.

Mr. Essam's returns:—

1895.—February 11. Occultation of Satellite I. Disappearance, $9^h 55^m$.

Satellite appeared very bright, even brighter than its primary. The occultation was exactly in a line with the N. equatorial belt. Its disappearance was very gradual, no hanging on noticed, air steady.

1895.—February 12. Satellite I. in transit. It appeared as a bright spot on the disk, casting a black, diffused, oblong spot on S. equatorial belt. Reappearance, $9^h 30^m$.

Its circular disk was well defined and much brighter than its primary.

Mr. Roberts returns as follows:—

Phenomena.	Date.	Beginning.	Ending.	Air, &c.
	1895.	h m s	h m s	
Ec. R. I. - - -	April 7 -	10 7 30	10 9 30	Unsteady.
Oc. R. III. - - -	" 10 -	7 4 28	7 6 30	Steady.
Ec. D. III. - - -	" 10 -	9 3 8	9 5 36	"
Oc. R. IV. - - -	" 10 -	9 48 10	9 50 36	Unsteady.
Oc. D. I. - - -	" 14 -	8 33 5	8 37 34	Wind.
Tr. E. I. - - -	" 15 -	8 0 38	8 5 58	"
Tr. T. II - - -	" 15 -	8 19 0	8 25 8	"
Th. E. I. - - -	" 15 -	9 16 9	9 17 25	Unsteady.
Sh. E. IV. - - -	" 19 -	7 5 30	7 11 0	Bright twilight.
Ec. R. I. - - -	" 23 -	8 29 0	8 30 18	Steady.

The watch used for these observations was timed by the Greenwich time ball, which falls 22 hours every morning at Wyatt's, Bournemouth.

Mr. Goodacre returns as follows:—

1895.—March 22. Satellite I. Occultation disappearance, 8^h 15^m. Appeared fully 2^m on limb as a faint white projection (cone-like) disappearing about the middle of the N. equatorial belt.

The Director's Return (a selection).

Date.	Sat.	—	Phase.	G.M.T.	Remarks.
1894. Dec. 4	I.	E.	Beginning to fade.	h m s 10 16 15	Time occupied by phenomena, 1 ^m 15 ^s .
	—	Dis.	Quite gone	11 17 30	
" 12	I.	<i>t</i>	External contact.	9 46 0	Poor observation.
" 20	III.	<i>t</i>	Do.	7 25 30	Hindering clouds.
	—	<i>t</i> Sha.	Do.	7 11 0	
" 27	III.	<i>t</i>	Do.	10 41 0	Hindering causes.
	—	<i>t</i> Sha.	Do.	11 11 0	
" 29	I.	E.R.	Bright	7 12 0	Good observation.
" 31	IV.	Sup. δ	δ	5 38 0	Companion time, 5 ^h 33 ^m 5 ^s . Callisto seemed to graze the limb. Cloud prevented observation of tangent time.
1895. Jan. 4	II.	E.R.	Bright	6 13 30	Companion time, 6 ^h 13 ^m 8 ^s .
" 7	III.	E.R.	First view	7 47 5	Good observation.
	—	—	Bright	7 49 45	
" 18	II.	Occ.	External contact.	7 28 5	
	—	—	Bisection. Internal contact.	7 33 20	Well seen on limb. Not observed.
" 21	I.	E.R.	First view	7 26 0	Fair observation.
	—	—	Bright	7 29 0	Companion time, 7 ^h 25 ^m .
" 28	I.	Occ.	First contact	6 12 30	Good observation.
	—	—	Last contact	6 15 15	
Feb. 19	III.	E.R.	First view	7 54 30	Good observation.
	—	—	Bright	7 59 0	
May 1	II.	Occ.	Last contact	8 15 0	Cloud.
Jan. 25	IV.	—	—	6 14 0	Callisto at tangent.
Feb. 5	II.	E.D.	Fading	5 52 0	Poor observation.
" 27	IV.	3 δ	—	—	Time uncertain.
Mar. 7	II.	Sha.	Ingress	8 16 0	Cloud hindering.
	—	—	Egress	10 57 0	It was interesting to see the shadow of I. overtaking the Sh. of II., and pass it.
	I.	<i>t</i>	Last contact	10 45 0	
	II.	—	Do.	10 57 0	
Apr. 3	III.	E.	Fading	5 6 0	Three minutes from first view to fully bright.
	—	—	Bright	8 4 0	

PART 4.

This part, as heretofore, will consist of a brief summary of the sectional work, and a few deductions therefrom.

1. Marked progress has decidedly been made in the latitude and longitude of the belts and markings. Well ascertained changes have been noted and recorded. A standard scale has been taken as a reference, the eye has been cultivated, and though there has been necessary diversity in style and ability; it is believed that the disk positions are more trustworthy than heretofore.

2. The colouring of the belts seems to have been caught by a larger number of Members during the apparition. This arises partly from an increase of aperture, but chiefly from closer attention, and the resulting development of the colour sense, and even in some few cases where Green's forms have not been used, the belt and spot tints have compelled record. Messrs. Corder, Paterson, Brenner, Foulkes, are among the leaders in this feature. In delicacy of tone, the drawings of Messrs. Cammell, Henderson, Maw, and Mee, leave little to be desired. In the later period of the apparition, the more delicate features of the planet were distinctly seen. Mr. Robert's numerous and interesting sketches are a striking instance of this.

3. Again the Director, in justice to his co-workers, feels bound to call attention to the diversities of instruments, air, vision, and experience which must ever characterise a large body of observers and as fully accounting for differences in delineation. Permit reference to the opening portion of Part IV. of the last Memoir.

We proceed to deductions from the large amount of observations and drawings to hand. First, the Great Red Spot has certainly been as visible and as ruddy as during last apparition. It is shown in 56 drawings as against 22 in last report. It is generally darker at the following end and diffused at the preceding, the faint aureola is only slightly indicated, there is no evidence that the spot shifts in latitude, but the S. temperate band is sometimes attracted by it. Light vapours sometimes overlie its central portions. It is the current opinion that the Red Spot is not strictly atmospheric but a protuberance from the more solid or viscous body of the planet, and the slender ligament connecting it with the S. temperate band remains a mystery.

Mr. Wykes suggests that the Great Red Spot is not strictly a spot at all, but a reflection of lurid light from the fires of an active volcano on the solid body of the planet. He thinks that the density of the planet's atmosphere would partially stop, and disperse the fiery light, and cause it to appear like flame behind ground glass. This theory would account for variability, and also for the gradual decay of luminosity since its maximum, though it hardly accounts for its ringed appearance, or for the diffuseness of its preceding end. The suggestion is nevertheless well worth further consideration, and careful observation with reference to it. Though the Section, as a whole, is not given to theorising, there can be little objection to the suggestion of causes of phenomena by such careful and industrious observers as

Mr. Wykes. Other observers speak of it as if seen through a veil.

The equatorial zone has received more attention this apparition, and the faint belt is shown on 158 drawings. It has sometimes appeared wavy and unequally dense. There is reason to believe that it is continuous, its broken aspect being due to overlying vapours. Early drawings of the present apparition indicate increasing visibility. The most interesting, and certainly the most variable of the features of this zone are the strange wisps, sometimes crossing from belt to belt and generally springing from a dark spot. Observers vary much in their delineations, but atmospheric conditions are all powerful here.

The S. equatorial belt has rivalled the N. in activity during the latter part of the apparition. The shoulder, its most prominent feature, has never been more dark and distinct. Its angle with the belt varies several degrees. It is a question of great interest to what extent it is influenced by the Red Spot. The next remarkable feature is the bifurcation of the belt preceding the Red Spot. It is difficult to ascertain its extent as the ends are ill-defined, but from a comparison of drawings it cannot be less than 190° in length, or about 76,000 miles, more than three times the circumference of the earth; the width varies considerably, if the drawings do not err. It is far more prominent than during last apparition. Its edges are fairly defined but no markings have yet been seen within the fork, although the light and dark spots have been detected on its edges. Strange rifts, long, short, curved, straight, are shown by all observers. These are probably overlying vapour driven by currents, and sometimes so far longitudinally as to give apparent duplicity to the belt. Can they be the ejecta of volcanoes far beneath the outer atmosphere of the planet?

The N. equatorial belt, although much disturbed, was less so than last apparition. Possibly the two equatorial belts are disturbed alternately. It would be most interesting to prove or disprove this suggestion. The N. equatorial belt was much disturbed in 1893 and 1894, while the S. was comparatively quiet. Now they are equal in activity. The apparent casting off of matter from the N. edge of this belt is still its most striking feature whether in lines in contact with N. temperate band or dark spots on the N. edge. Over a dozen light and dark spots have been seen at one time on this edge of the belt and some curious rifts have been observed almost at right angles to the belt. In addition the N. tropical zone has exhibited broken lines of dark matter apparently evolved from the zone itself, and suggesting the formation of an additional belt.

The S. tropical zone has had several white spots on it of less striking character than during the last apparition.

The N. and S. temperate bands have not exhibited any remarkable features. There have been occasional thickenings of the S. band and some disturbance of its edges, the N. temperate band has shown a greenish tint, not noticed a few years ago, when the band was abnormally active. Dark and light spots have been seen on this band and the edges have been slightly serrated. But its most

marked characteristic was its deviation from parallelism with the equator, a rare feature in any belt.

The N.N. and S.S. temperate bands have been frequently seen, but no marked features are noted except an occasional broken appearance.

The Polar regions have frequently been seen ringed and a large dark marking has been seen enveloping the whole N. Pole.

Attention is requested to these portions of Jupiter. Diligent observation may be rewarded here as elsewhere, although the curvature of the globe foreshortens details to so great an extent.

Before concluding this Report, the Director would wish to express his pleasure at the wholly unexpected reception of Dr. Roberts' classical work on "Nebulæ and Star Clusters," as a token of the Section's appreciation of his efforts to serve them. The Director feels he is still more at one with them in Jovian research and observation by this act of considerate kindness on their part. It was a red letter day when the volume came into his possession, and if it bear fruit in more diligent mutual work, it will be a pleasing chapter in the history of the Section.

Distribution of Drawings.

Several of the Members have kindly permitted that a few sample drawings should be sent to enrich the library of the New South Wales Branch. They will be fixed in a separate small album with brief descriptions, and submitted to the Council for approval of the purpose, and forwarded by the Secretaries if its approval be conceded. It is thought that such acts on the part of the Parent Association will cement the alliance, and prove of mutual advantage. The other Branches can, perhaps, be better served by loans of drawings, at least at present. It is purposed to increase the number of these loans by the Jupiter Section during the coming apparition. Members outside the Section have expressed a hope for similar loans, and it is hoped (with the approval of the Council) that some plan may be devised to meet this wish, especially when the applicant is at a distance from the Association Library.

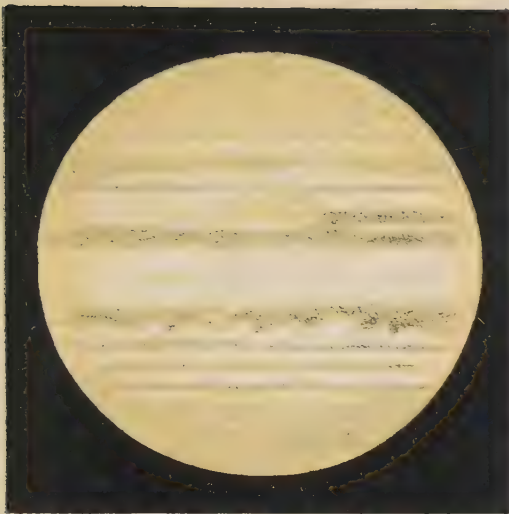


Fig. 1. W R. Waugh, 4 $\frac{1}{2}$ " O.G. Power 200
1894 Nov 30 9^h 32^m Long 0°



Fig. 2 A. Henderson, 10" Spec: Power 262
1894 Oct 22 13^h 17^m Long 19°

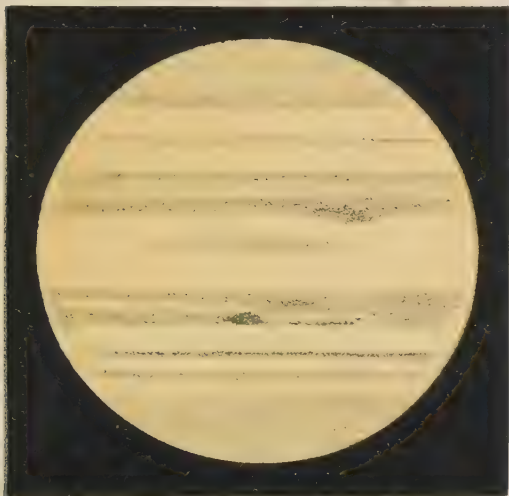


Fig. 8. Arthur. Mee, 8 $\frac{1}{2}$ " Spec: Powers 200 & 250
1895 Mar 31 7^h 20^m Long 89°

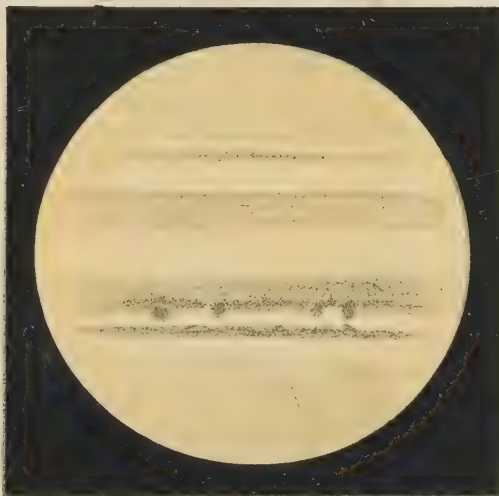


Fig. 9 G T Davis, 3 $\frac{1}{2}$ " O.G.: Power 200
1894 Nov 21 10^h 20^m Long 102°

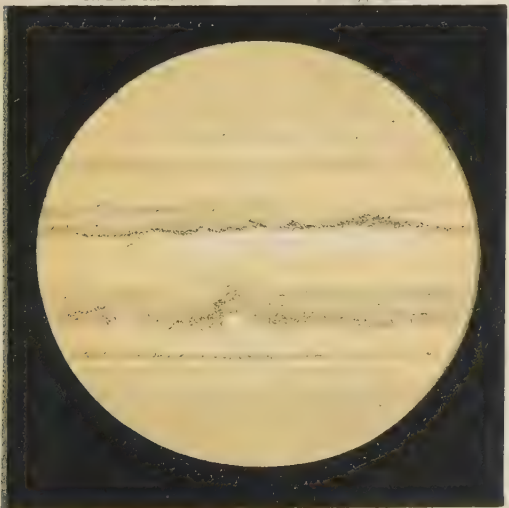


Fig. 15. A. Henderson, 10 $\frac{1}{2}$ " Spec: Power 150.
1894. Oct. 14. 13^h 10^m Long 282°

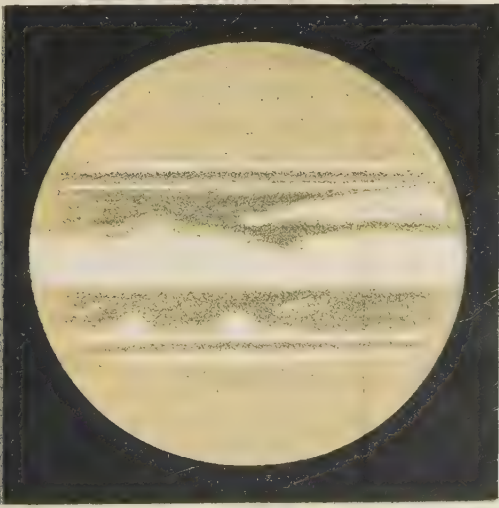


Fig. 16 W. Goodacre, 12" Spec: Power 280
1895 Mar 1 8^h 30^m Long 309°



SECTION FOR THE OBSERVATION OF THE SUN.

DIRECTOR.--MISS E. BROWN.

FOURTH REPORT OF THE SECTION, 1894.

Introduction.

The accompanying report of the Solar section for 1894 will be found to correspond in arrangement with those of previous years, the "Calendar" giving the number of groups visible on each day, and also the most conspicuous faculæ, the "Ledger" their life history and heliographic latitudes and longitudes, which Mr. Maunder has again been good enough to revise. Where only one figure is given it signifies that the mean position of the group only has been entered.

In bulk of material this report almost equals that of 1893, the number of groups amounting as a total to only six less. This proportion, bearing in mind that the numbering of the groups must, to a certain extent, be arbitrary, rather strikingly coincides with the summary of sun-spot observations taken at Zurich, by Dr. A. Wolfe, for the same year, in which he gives the mean observed relative number of spots as 78.0 against 84.9 in 1893.

In this report there are 27 days without any record, only five days more than in 1893, which, it will be remembered, was an exceptionally favourable year for observations; this, considering that our number of regular observers is only eight, seems not unsatisfactory.

The Rev. F. J. Eld and Mr. J. S. Townsend have furnished diagrams of position as before, and Mr. Townsend photographs of sun-spots also, and especial thanks are again due to Prof.

Pereira for his valuable contributions, which have continued to supply many of the deficiencies so unavoidable in this climate.

Two observers only in the following list, the Rev. W. R. Waugh and Mr. Wykes, use the method of direct vision, the other drawings being all taken by projection. More details on a large scale would be acceptable from Members of the Section.

The illustrations appended have been chosen as exhibiting specimens of a few of the most interesting groups, taken as nearly as possible on the same scale.

Some among them call for particular attention as showing instances of the difference in tint often noticed in the nuclei of large spots, termed by Prof. Pereira "black holes," to which allusion has already been made in the "Journal," Vol IV., p. 300. Such are—

Plate III., Group CX., May 18.

" VI. " CXXXVI.

" VIII. " CLXXXVI., August 17.

" VIII. " CCXIX., October 7.

The luminous bridges are strikingly exemplified in

Plate III., Group CX., May 16.

" VIII. " CXIX., October 4 and 7.

NAMES of OBSERVERS from whom drawings, or diagrams, have been regularly received during the year.

Name.	Address.	Instrument.
BARTLETT, J.	Bramley -	4-in. O.G.
BROWN, MISS E.	Cirencester -	3 and $3\frac{1}{2}$ -in. O.G.
CORDER, H.	Bridgewater -	$6\frac{1}{2}$ -in. Spec.
ELD, REV. F. J.	Polstead Rectory.	$8\frac{1}{2}$ -in. Spec.
PEREIRA, J. DE MORAES	Azores -	$4\frac{1}{2}$ -in. O.G.
TOWNSEND, J. S.	Sevenoaks -	$4\frac{1}{2}$ -in. O.G.
WAUGH, REV. W. R.	Portland -	$4\frac{1}{2}$ -in. O.G.
WYKES, J.	Birmingham -	4-in. O.G.

April 22, 1896.

E. BROWN,
Director of the Section.

Calendar of Sun-spots and Faculae.

JANUARY 1894.

Day.	Groups of Sun-spots.	Faculae.
1	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	E. 10° to 22° N. One patch bright. W. 7° to 24° S.; 13° to 30° N.
2	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	S.E. extensive.
3	4, 5, 6, 7, 8, 10, 11, 15, 16	N.W. numerous.
4	4, 5, 6, 7, 8, 15, 16	E. 12° to 20° N.; 5° to 20° S. W. 5° to 16° N.
5	6, 7, 8, 15, 16	E. f. group 16.; N.W.
6	7, 8, 15, 16, 17, 18, 19	N.W. numerous.
7	15, 16, 17, 18	E. 17° to 30° N. W. 8° to 30° N.; 22° to 34° S.
8	15, 16, 17, 18.	
9		
10	15, 16, 18, 20, 21, 22.	
11	15, 16, 18, 20, 21, 22, 23	E. 0° to 15° S. W. numerous, p. 16.
12	15, 16, 18, 20, 21, 22, 24	E. 7° to 18° N.; 0° to 15° S. W. small, bright, 28° N. 3° to 20° S.
13	16, 18, 20, 21, 22, 23, 24, 25	Some tiny spots not far from centre of disk.
14	16, 18, 20, 21, 22, 23, 25, 26	Three very small spots in Long. 339°, 9° and 4°. Lat. 25°, 16° N., 8° S.
15	21, 22, 23, 25, 26, 27, 28	E. 0° to 20° N.; 0° to 22° S. W. 20° to 35° N.; 12° to 27° S.
16	21, 22, 23, 25, 26, 27, 28	E. 0° to 25° N.; 0° to 22° S. W. 15° to 33° N.; 16° to 28° S.
17	21, 22, 23, 25, 26, 27, 28, 29	N.E. N.W. extending far from limb.
18	21, 22, 23, 25, 26, 27, 28, 29, 29A, 29B.	
19	21, 22, 23, 25, 26, 27, 28, 29, 29A	E. 17° to 25° N.; 5° to 23° and 30° to 45° S. W. 18° to 30° N.; 18° to 27° S.
20	21, 22, 23, 25, 26, 27, 28, 29, 29A, 30, 31	E., N., and S. Some distance from limb and equator.
21	22, 23, 25, 26, 27, 28, 29, 29A, 30, 31.	
22		
23	25, 26, 27, 28, 29, 30, 31, 32, 33	E. 15° to 25° N.; 0° to 17° S. W. 0° to 12° N.; 15° to 20° S.
24	26, 27, 28, 29, 30, 31, 32, 33, 34, 35	E. 10° to 22° N.; 8° to 17° S. W. 0° to 10° N.
25	26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37	N.E. f. group 36.
26	26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37	E. 25° to 35° N.; 13° to 23° S.
27	29, 33, 34, 35, 36, 37	N.E. near limb. W. numerous N. and S. and N. of three small spots not numbered.
28	29, 33, 34, 35, 36	E. 20° to 33° N.; 10° to 20° S. W. 20° to 30° N.; 0° to 33° S.
29	33, 34, 35, 36, 38, 39	E. very extensive. W. p. groups 33 and 34.
30	33, 34, 35, 36, 38, 39	E. 20° to 35° N.; 5° to 22° S.W. Three patches conspicuous, 8° to 30° N.
31	33, 35, 36, 38, 39	E. f. 28, N.E. f., a small spot not numbered. S.W. bright near limb in two places.

FEBRUARY 1894.

Day.	Groups of Sun-spots.	Faculae.
1	33, 35, 36, 38, 39, 40 - - -	E. 26° to 35° N.; 10° to 20° S. W. 6° to 30° N.; 6° to 20° S.
2		
3	35, 38, 39, 40, 41 - - -	E. 10° to 33° N.; 0° to 15° S.
4	35, 38, 39, 40, 41 - - -	E. 14° S. and 20° to 25° S. W. 12° to 25° N.; 9° to 16° S.
5	38, 39, 40, 41, 42, 43 - - -	E. a patch near equator. A small black dot, in Long. 136°, Lat. 3° N.
6		
7	38, 39, 41, 42, 43, 44.	
8	38, 39, 41, 42, 43, 44, 45, 46, 47 - -	E. 8° to 20° N.; 5° to 15° S. W. 7° to 30° N.
9	39, 41, 42, 43, 44, 45, 46, 47, 50.	
10	39, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51.	
11	42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53 -	E. S. of Group 49. W. a patch not near limb (position of 39).
12	42, 43, 44, 46, 47, 48, 49, 51, 53 - -	E. between 48 and 49. W. numerous, region of 42.
13	42, 43, 46, 47, 48, 49, 51, 52, 53 - -	E. on a line with 48; p. 52 patch near limb. W. p. 43, far from limb.
14	43, 46, 48, 49, 51, 53 - - -	E. 0° to 30° S. W. 10° to 35° N.; 0° to 10° S., far from limb. Three dots widely separated s. p. 53.
15		
16	43, 46, 48, 49, 53, 54, 55, 56 - - -	E. N. of 56. W. p. 46.
17	46, 48, 49, 53, 54, 55, 56, 57.	
18	46, 48, 49, 53, 54, 55, 56, 57 - - -	E. 2° to 25° N. great extent. W. 0° to 40° S.
19	48, 49, 54, 55, 56, 57, 53, 59 - - -	E. far N. of 58. W. 0° to 16° N.
20	48, 49, 54, 55, 56, 57, 58, 59, 60 - -	E. 0° to 15° N. 5° to 35° S. W. 10° to 25° N.
21	48, 49, 54, 55, 56, 57, 58, 59, 60, 61 -	E. 0° to 30° N.; 0° to 35° S.; f. 57, 58, 59. W. between 49 and 60.
22	49, 54, 55, 56, 57, 58, 59, 60, 61 - -	Following 53 far from limb; f. 59, near limb, conspicuous.
23	55, 56, 57, 58, 59, 61 - - -	E. 0° to 3° N.; 0° to 21° S. W. 0° to 22° N.; 0° to 18° (unbroken).
24	55, 56, 57, 58, 59, 61 - - -	E. 10° to 20° N.; 10° to 25° S. W. 10° to 15° N.; 0° to 23° S.
25		
26	56, 57, 58, 59, 61, 62.	
27	56, 57, 58, 59, 61, 62, 63 - - -	E. 10° to 25° S. W. 5° to 25° N.
28	56, 57, 59, 61, 62, 63.	

MARCH 1894.

Day.	Groups of Sun-spots.	Faculae.
1		
2	57, 59, 62, 63, 64 - - -	E. 18° to 30° S. W. 0° to 13° N., and a patch 30° N.
3	57, 62, 64 - - -	E. 5° to 20° N.; 5° to 15° S. W. 18° to 35° N.; 8° to 20° S.
4	62, 64, 65, 66 - - -	E. 8° to 28° N.; 0° to 30° S. W. 5° to 12° N.; 16° to 28° S.
5	64, 65, 66, 67 - - -	E. n. f. group 65, s. f. 67. S.W. region of 62.
6	64, 65, 66, 67 - - -	E. n. f. 65, s. f. 67. W. bright far N. and about 26° S.
7	65, 66, 67, 68, 69, 70 - -	E. s. f. 70 and 69. W. same as on the 6th. Three dots in Long. 322°, Lat. 5° S.
8	65, 67, 68, 70 - - -	W. extensive to the S., a bright patch about 8° N.
9		
10	65, 67, 69A, 69B, 70, 71, 72 -	E. bright 13° to 16° S.
11	65, 67, 69A, 69B, 70, 71, 72 -	W. a patch near the equator.
12	65, 67, 69A, 69B, 70, 71, 72 -	E. numerous s. f. 71.
13	67, 69A, 69B, 70, 71, 72, 73, 74 -	W. p. 73.
14	67, 69B, 70, 71, 72, 74 - -	E. 15° to 28° S. W. 5° to 30° N.; 3° to 20° S.
15	67, 69B, 70, 71, 72, 74.	
16	67, 69B, 70, 71, 72, 74 - -	E. 25° to 38° N.; 7° to 14° S. W. 6° to 27° N.; 0° to 22° S.
17	70, 71, 72, 75 - - -	E. 15° to 30° N.; 0° to 40° S. W. 0° to 30° N.
18	70, 71, 72, 75 - - -	E. 10° to 20° N.; 10° to 45° S. W. 8° to 24° N.
19	71, 72, 75, 75A, 75B - -	A small spot near centre not numbered. Long. 202°, Lat. 22° S.
20	71, 72, 75, 75A, 76.	
21	71, 75A, 76, 76A - - -	E. 10° to 30° S. W. 10° to 25° N.
22	75A, 76, 76A - - -	E. 3° to 27° S.
23	75A, 76, 76A, 77 - - -	Very little on either limb. A small spot in Long. 170°, Lat. 13° S.
24	75A, 76, 77, 78 - - -	E. 12° to 30° N.; 12° to 25° S.
25	76, 78 - - -	E. 7° to 22° N.; 7° to 25° S. W. 12° to 27° N.
26	76, 78, 78A, 79 - - -	E. 2° to 22° N.; 16° to 30° S. W. 26° to 40° N.
27	76, 79, 80, 80A, 81 - - -	E. 5° to 18° N.; 15° to 30° S.
28	76, 79, 80, 80A, 81, 82, 82A -	E. 15° to 28° N.; 18° to 30° S. W. 2° to 25° S.
29	76, 79, 80, 80A, 81, 82, 82A -	E. 10° to 30° N. W. 0° to 20° N.; 0° to 25° S.
30	76, 79, 80, 80A, 81, 82, 82A -	E. 10° to 28° N.; 0° to 12° S. W. 0° to 40° N.; 0° to 22° S.
31	76, 79, 80, 81, 82, 83 - - -	E. 12° to 22° N.; 6° to 28° S. W. 0° to 30° N. On the 30th a pair of very small spots and dots, Long. 145°, Lat. 14° S. On the 31st a few very small spots. Long. 80°, Lat. 15° S.

APRIL 1894.

Day.	Groups of Sun-spots.	Faculæ.
1	79, 81, 82, 83, 84 - - -	E. 0° to 25° S. W. 20° to 40° N.
2	79, 81, 82, 83, 85 - - -	E. 5° to 30° S. W. 8° to 35° N. Small pair of spots, Long. 14°, Lat. 5° S.
3	79, 81, 82, 83, 85 - - -	E. 19° to 23° N.; 7° to 35° S. W. 17° to 32° N.
4	79, 81, 82, 83, 85, 86.	
5	79, 81, 81A, 82, 83, 85, 86 - -	E. 17° to 23° N. W. 3° to 20° N. A dot, Long. 30°, Lat. 24° S. Two little spots, Long. 313°, Lat. 9° S.
6	79, 81, 81A, 82, 85, 86, 87.	
7	81, 81A, 82, 83, 85, 86, 87 - -	W. 15° to 23° S.
8	81, 82, 83, 85, 86, 87, 88 - -	E. 10° to 25° S. W. 20° to 32° S.
9	83, 85, 86, 87, 88 - - -	E. 20° to 33° S.
10	83, 85, 86, 87, 88 - - -	E. 20° to 34° S. W. 15° to 23° N.
11	83, 86, 87 - - -	E. 15° to 30° S. W. 11° to 25° N.; 14° to 30° S.
12	83, 86, 89 - - -	E. 10° to 27° S. W. 7° to 18° N.; 12° to 25° S.
13	86, 89 - - -	E. 10° to 25° S. W. 12° to 30° N.
14	86, 89, 90, 91 - - -	A dot among faculæ, Long 163°, Lat. 13° N.
15	86, 89, 90, 91 - - -	E. 7° to 25° N.; 0° to 25° S.
16		
17	89, 90, 91 - - -	E. 7° to 25° N.; 27° to 38° S. W. 15° to 22° N.
18	89, 90, 91 - - -	E. 7° to 20° N.; 27° to 38° S. W. 15° to 23° N.
19	89, 90, 91, 92.	
20	89, 90, 91, 92.	
21	89, 90, 92 - - -	E. 14° to 30° N. W. 10° to 25° N.
22	89, 90, 92, 93, 94, 95, 96.	
23	89, 90, 92, 93, 94, 95, 96 - -	E. 9 to 28° S. W. 0° to 28° N.
24	89, 90, 92, 93, 94, 95, 96 - -	E. 10° to 38° N.; 18° to 32° S. W. 5° to 23° N.; 10° to 25° S. A small spot with dots, Long. 74°, Lat. 13° N.; also on the 25th.
25	89, 90, 92, 93, 94, 95, 96, 97 - -	E. 7° to 30° N.; 20° to 33° S. W. 0° to 20° S.
26	90, 92, 93, 94, 95, 96, 97, 98 - -	A cluster of faculæ between 96 and 97.
27	90, 92, 93, 94, 96, 97, 98 - -	A few small spots, Long. 168°, Lat. 7° N., seen also on the 28th. A dot, Long. 358°, Lat. 7° S.
28	92, 93, 95, 96, 97, 98 - -	F. group 98.
29	92, 93, 95, 96, 97, 98 - -	E. 0° to 40°. W. 10° to 25° N.
30	92, 93, 95, 96, 97, 98 - -	A pair of small spots and dots to the N. of them, Long 145°, Lat. 14° S.

MAY 1894.

Day.	Groups of Sun-spots.	Faculae.
1	92, 93, 95, 96, 97, 98, 99, 100, 101	E. 10° to 23° N. W. 15° to 37° S.
2	95, 97, 98, 99, 100, 101, 102	E. 7° to 31° N. W. 15° to 30° N.; 14° to 30° S.
3	95, 97, 98, 99, 100, 101.	
4	95, 97, 98, 99, 100, 103, 104	E. 13° to 30° N. W. 10° to 35° N.
5	98, 99, 101, 103, 104, 105	W. 10° to 35° N.
6	98, 99, 101, 103, 104	W. 15° to 4° S.
7	98, 101, 103, 104, 105.	
8	98, 101, 104, 105	S.E. small but conspicuous.
9		
10	101, 105, 106, 107, 108, 109.	
11		
12	101, 109, 110, 111, 113.	
13	109, 110, 111, 113	W. 7° to 32° N. A few to the S.
14	109, 110, 111, 112, 113, 114	E. 12° to 25° S. W. 12° to 24° N.
15	109, 110, 113, 114	E. 14° to 21° S. W. 17° to 23° N. A dot in long. 255°, lat. 11° S.
16	109, 110, 113, 114, 115	A few near S.E. limb, and S.W. limb.
17		
18	109, 110, 111, 113, 114, 115, 116, 117, 118, 119, 120.	
19	110, 111, 113, 114, 115, 116, 118, 119, 120.	
20	110, 113, 115, 118, 119, 120	N.E.
21	110, 113, 115, 118, 119, 120	E. 20° to 30° N. extending 30° from limb.
22	110, 113, 115, 118, 119, 120, 121	S.E. conspicuous.
23		
24	113, 115, 118, 119, 120, 121, 122	E. about 20° N., large but faint.
25	115, 118, 119, 120, 121, 122	E. numerous, 20° to 30° S. W. conspicuous round 115.
26	115, 119, 120, 121, 122, 123	E. to the S. still numerous.
27	119, 120, 121, 122, 123, 124.	
28	119, 120, 121, 122, 123, 125.	
29	119, 120, 121, 122, 123, 125.	
30	120, 121, 122, 123, 125, 126.	
31	120, 121, 122, 123, 125, 126, 127, 128.	

JUNE 1894.

Day.	Groups of Sun-spots.	Faculae.
1	121, 122, 123, 125, 126, 127, 128.	
2	122, 123, 124, 125, 126, 127, 128, 129, 130	E. a patch just N. of equator, with black dots some distance from limb. W. in three places N.
3	122, 123, 124, 125, 126, 127, 128, 129, 130, 131.	
4	122, 123, 126, 128, 129, 130, 131, 132 -	E. numerous. W. N. of 122 and far to the S.
5	123, 128, 129, 130, 131, 132, 133 - -	W. near limb p. 123, and far to the S.
6	123, 128, 130, 131, 132, 133, 134 - -	E. region of 132 and 133 numerous. W. extensive to the S.
7	123, 128, 130, 131, 132, 133, 134 - -	E. extensive round and f. 134.
8	128, 130, 131, 132, 133, 134, 135.	
9	128, 130, 131, 132, 133, 134, 135, 136 -	Numerous f. the groups near E. limb and p. those near W. limb.
10	128, 130, 131, 132, 133, 134, 135, 136, 137.	
11	132, 133, 134, 135, 136, 137 - -	E. 8° to 30° S.
12	131, 133, 134, 135, 136, 137, 138.	
13	131, 133, 134, 135, 136, 137, 138, 139, 140, 141.	E. a broad patch half way between 138 and limb. W. p. 131.
14	131, 133, 134, 135, 136, 137, 138, 139, 140, 141.	E. 4° to 15° N.; 3° to 25° S. W. p. 133 and 131.
15	131, 133, 134, 135, 136, 137, 138, 139, 140, 141.	E. 0° to 30° S. W. 0° to 14° N.; 0° to 5° S.
16	134, 136, 137, 138, 139, 140, 141, 142 -	E. a patch f. 141. Near limb. W. 0° to 12° N. Numerous 10° to 33° S.
17	136, 137, 138, 139, 141, 142, 143 - -	E. on a line with 141.
18	136, 137, 138, 141, 143, 144 - -	E. 20° to 34° N. W. 0° to 14° N.; 0° to 25° S.
19	136, 137, 138, 141, 143, 144 - -	E. numerous N. and S.
20	137, 138, 141, 143, 144, 145, 146.	
21	137, 138, 141, 143, 144, 145, 146 - -	E. 0° to 21° N.; 0° to 10° S. W. 0° to 15° N.; 0° to 2° and 10° to 25° S.
22	137, 138, 141, 143, 144, 145, 146 - -	E. still conspicuous to the S.
23	138, 141, 144, 145, 146, 147 - -	W. 0° to 13° N.; 18° to 26° S.
24	141, 145, 146, 147, 148 - -	E. 5° to 25° N.; 5° to 14° S. W. 12° to 23° S.
25	141, 145, 146, 147, 148, 149 - -	E. 5° to 14° N. W. 12° to 23° S. Numerous.
26	141, 145, 146, 147, 148, 149 - -	E. one bright patch on a line with 148, where 151 afterwards appeared.
27	145, 146, 147, 148, 149 - -	E. 10° to 23° N. W. 15° to 32° S.
28	145, 146, 147, 148, 150, 151 - -	E. 0° to 5° N. The bright patch still visible. W. 5° to 35° N.; 10° to 22° S.
29	145, 146, 147, 148, 150, 151, 152 -	E. 0° to 6° N.; 0° to 5° S. W. 0° to 12° N.
30	145, 146, 147, 148, 150, 151, 152 - -	E. 14° to 24° N.; 5° to 16° S. W. 20° to 33° S.

JULY 1894.

Day.	Groups of Sun-spots.	Faculae.
1	145, 146, 147, 150, 151, 152, 153 - -	E. 0° to 15° S. Conspicuous some distance from limb, W. 23° to 36° S.
2	147, 150, 151, 152, 153, 154, 155, 156 -	E. f. 153, s. p. 155. W. s. p. 150. N. region of 145.
3	147, 152, 153, 154, 155, 156, 157.	
4	152, 153, 154, 155, 156, 157 - -	E. 7° to 32° S. W. 0° to 25° N.; 22° to 25° S.
5	152, 153, 154, 155, 156, 157 - -	E. 25° to 35° N.; 19° to 35° S. and 0° to 13° S.
6	152, 153, 154, 155, 156, 157, 158, 159, 160	E. 0° to 14° N.; 0° to 40° S.
7	153, 154, 155, 156, 157, 159, 160, 161 -	E. 0° to 5° and 14° to 28° S. W. 3° to 15° S.
8	153, 154, 155, 156, 157, 159, 160, 161 -	E. 0° to 18° N. W. 0° to 7° N. Some distance from limb, 0° to 12° S.
9	153, 155, 156, 157, 159, 160, 161, 162 -	E. 0° to 17° N.; 8° to 40° S. W. 0° to 5° N.; 0° to 6° S.
10	153, 155, 156, 157, 159, 160, 161, 162, 165, 166.	
11	155, 156, 157, 159, 160, 161, 162, 163, 164, 165, 166.	N.E., with one small spot. N.W., extensive near limb.
12	156, 157, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168.	E. n. p. Group 168. W. p. 155 and s. of 159.
13	156, 157, 160, 161, 163, 164, 165, 166, 167, 168, 169.	E. s. of 169. W. many n. p. 157.
14	156, 157, 160, 161, 163, 164, 165, 166, 167, 168, 169.	E. many, region of 169. W. s. p. 157.
15		
16	160, 161, 163, 165, 166, 167, 168, 169, 169A, 170.	E. region of 169A. W. p. 160.
17	160, 161, 163, 166, 167, 168, 169, 169A, 170.	E. far N. Faint f. 169A.
18	160, 161, 166, 167, 168, 169, 170, 171.	
19	161, 166, 167, 168, 169, 170, 171.	
20	166, 167, 168, 169, 170, 171, 172 - -	E. numerous 10° to 25° N. and far S. W. s. p. 166.
21	166, 167, 168, 169, 170, 171, 172, 173 -	E. s. of 172. W. s. p. 166.
22	166, 168, 169, 170, 171, 172, 173 -	E. 8° to 25° N.
23	168, 170, 171, 172, 173, 174.	
24		
25	170, 171, 172, 173, 173A, 174 - -	E. 5° to 18° N. W. 15° to 30° S.
26	170, 171, 172, 173, 174.	
27	170, 171, 172, 173, 174 - -	E. 10° to 25° N.; 16° to 20° S. W. 3° to 15° N.; 20° to 30° S.
28	170, 171, 172, 173, 174 - -	E. 5° to 30° N.; 10° to 22° S. W. 5° to 24° N.; 29° to 30° S.
29	170, 171, 172, 173, 174, 175, 176 - -	E. 5° to 18° N.; 12° to 30° S. W. 5° to 18° N.; 25° to 30° S.
30	171, 172, 173, 174, 175, 176 - -	S.E. numerous. W. region of 171, and s. of it.
31	172, 173, 174, 175, 176 - -	E. 0° to 20° N.; 23° to 30° S. W. 10° to 22° N.; 3° to 15° S.

AUGUST 1894.

Day.	Groups of Sun-spots.	Faculæ.
1	173, 174, 175, 176, 177, 181.	
2	173, 174, 175, 176, 177, 178, 179, 180, 181	E. limb extensive, region of Groups 178, 179, 180, 181.
3	174, 176, 177, 178, 179, 180, 181 -	E. 0° to 23° N.; 0° to 23° S.
4	176, 177, 178, 179, 180, 181 -	E. 0° to 25° N.; 10° to 25° S. W. 7° to 25° N.
5	176, 178, 179, 180, 181 -	E. 2° to 13° N. Near 178.
6	176, 178, 179, 180, 181.	
7	176, 178, 180, 181, 182, 183, 184 -	E. 8° to 30° S. W. 8° to 20° N.; 10° to 30° S. Some distance from limb.
8	176, 178, 180, 181, 182, 183, 184.	
9	176, 178, 180, 182, 183, 184 -	E. numerous f. 183, and more N. W. Position of 181.
10	176, 178, 180, 182, 183, 184 -	E. numerous f. groups near limb and N. of them. W. s. p. 180, with three very small spots.
11	176, 180, 182, 183, 184 -	W. 15° to 35° S.
12	178, 180, 182, 183, 184 -	E. 0° to 10° N.; 0° to 5° S. W. 0° to 15° N.; 7° to 35° S.
13	178, 180, 182, 183, 185, 186 -	E. 0° to 18° N. W. 7° to 20° N.; 8° to 26° S.
14	180, 182, 183, 185, 186 -	E. 9° to 12° N.; 30° to 40° S. W. 0° to 18° N.; 10° to 22° S.
15	182, 183, 185A, 186, 187, 188 -	E. 0° to 22° N.; 20° to 30° S. W. 0° to 18° N.
16	182, 183, 185A, 186, 187, 188, 189	E. 15° to 23° N.; 8° to 30° S.
17	182, 183, 186, 187, 188, 189, 190, 191.	
18	182, 183, 186, 187, 188, 189, 190, 191 -	E. 10° to 33° N.; 8° to 23° S. region of 189. W. 10° to 30° S.
19	183, 186, 187, 188, 190, 191 -	E. p. Group 189 and 191. W. 10° to 15° N.
20	186, 187, 188, 190, 191, 192 -	E. 16° to 23° N. W. 10° to 30° S. around patch p. 186.
21	186, 187, 188, 190, 191, 192 -	E. 15° to 25° N.; 23° to 34° S. W. 0° to 10° N.; 0° to 5° S. and 10° to 23° .
22	186, 187, 188, 190, 191, 192 -	E. 16° to 30° N. W. 0° to 11° N.; 0° to 5° S. and 30° to 40° S.
23	188, 190.	
24		
25	190 - - -	E. extensive p. 195, s. f. 194. W. s. p. 193, and patches to the S., one very far S.
26	193, 194, 195 - - -	E. 0° to 18° N. far from limb. 0° to 3° S. and 20° to 30° . W. 7° to 17° S.
27	193, 194, 195.	
28	193, 194, 195 - - -	E. f. 195 considerable, 20° or more S. W. 10° to 20° S.
29	194, 195 - - -	E. 0° to 11° N. round patch f. 195. W. 17° to 30° S. and 35° to 40° .
30	194, 195, 196 - - -	E. 5° to 23° N.; 11° to 35° S. W. 15° to 36° N.; 0° to 10° S.
31	194, 195, 196 - - -	E. widespread 5° to 25° N.; 10° to 27° S., one small and bright patch near limb, with pair of small spots. W. 10° to 25° N.

SEPTEMBER 1894.

Day.	Groups of Sun-spots.	Faculae.
1	194, 195 - - - - -	E. The bright patch of Aug. 31 still visible, another more S.
2	194, 195 - - - - -	E. 10° to 15° and 30° S. Round a veiled spot. Long. 160°. Lat. 27° S. A small spot in Long. 137°, Lat. 12° S.
3		
4	194, 195 - - - - -	W. to the N., and far S. some distance from limb.
5	195, 197, 198, 199 - - -	N.W. extensive p. Group 195.
6	195, 197, 198, 199, 200, 201, 202, 203 -	E. 0° to 20° N.; 8° to 18° S. W. 0° to 20° N.
7	195, 197, 198, 199, 201, 202, 203, 204, 205	Region of 195, numerous.
8	197, 198, 199, 201, 201A, 202, 203, 204, 205, 206, 207.	W. extensive far S.
9	197, 199, 201, 201A, 202, 203, 204, 205, 206, 207, 208.	W. same position?
10	197, 199, 201, 201A, 202, 203, 204, 205, 207, 208.	E. 2° to 25° N.; 18° to 30° S. W. 10° to 33° S.
11	199, 201, 201A, 202, 203, 204, 207, 208, 209.	E. 6° to 16° S.; W. 0° to 12° N.; 12° to 33° S.
12	199, 201, 201A, 202, 203, 207, 209.	
13	199, 201, 201A, 202, 203, 207, 209, 210, 211.	F. Group 209.
14	201, 201A, 202, 203, 209, 210, 211 -	E. 0° to 6°, and 12° to 28° N.; 0° to 12°, and 35° to 40° S. W. 25° to 35° N.; 10° to 25° S.
15	201, 202, 209, 211, 212 -	E. many f. and s. of 209. W. near limb far N.
16	201, 202, 209, 211.	
17	201, 202, 209, 211 - - -	W. f. and s. of 201, as far as equator.
18	201, 202, 209, 211 - - -	N.W. as on the 17th, and S.W. region of 202.
19	211, 213 - - - - -	E. 15° to 24° N. W. 12° to 28° S.
20	211, 213 - - - - -	W. Two bright patches far from limb.
21	211, 213, 213A - - -	E. many f. 213, p. 213A; S.W. far from limb.
22	211, 213, 213A, 214.	
23	211, 213, 213A, 214 -	E. very extensive, 0° to 20° N.
24	211, 213, 213A, 214 - - -	N.E. far from limb.
25	211, 213, 213A, 214 - - -	N.E. same position, S.E. near limb.
26	213, 214 - - - - -	E. extensive, N. and S.
27	213, 215, 216 - - - - -	E. 8° to 25° N.; 15° to 22° S.
28	213, 215, 216 - - - - -	E. 5° to 14° N.; 12° to 21° S.
29	213, 215, 216, 217 - - -	E. 6° to 20° N.; 10° to 23° S. W. 7° to 23° N.; 20° to 26° S.
30	215, 216, 217, 217A, 218 - - -	E. 8° to 30° S.; 0° to 22° N.

OCTOBER 1894.

Day.	Groups of Sun-spots.	Faculae.
1	215, 216, 217, 217A, 218 - -	W. extensive to the N. and S.
2	215, 217, 217A, 218, 219, 220 -	E. 3° to 15° N.; 0° to 22° S. W. 6° to 25° N.; 18° to 30° S.
3	215, 217, 217A, 218, 219, 220, 221	S.W. numerous.
4	215, 217, 217A, 218, 219, 220, 221	E. f. groups 219, 221. W. region of 218. 20° S. far from limb.
5	215, 217, 217A, 219, 220, 221.	
6		
7	215, 217A, 219, 220, 221, 222 -	W. 10° to 15° S.
8	215, 217A, 219, 220, 221, 222 -	S.W. conspicuous p. 217A.
9	215, 219, 220, 221, 222 -	E. near equator. S.W. position of 217A.
10	219, 220, 221, 222, 223 - -	N.E. and f. 223. S.W. numerous.
11		
12	219, 221, 221, 222, 223, 224, 225 -	E. near equator.
13	219, 220, 221, 222, 223, 224, 225	E. 3° S. W. numerous region of 219.
14	219, 220, 221, 222, 223, 224, 225 -	E. N. and S.
15	221, 222, 223, 225 - -	N.E. near limb. W. p. 225, n.f. 221.
16	222, 223, 225 - - -	N.E. A patch considerably to the S.
17	226 - - -	E. near limb.
18	226, 227 - - -	E. n. of 226. W. 5° and 14° S.
19	226, 227, 228, 229.	
20	226, 228, 229 - - -	E. f. 228 and 229.
21	226, 228, 229 - -	E. round 229. W. region of two very small spots, one N., one S. Some distance from limb, not numbered.
22	226, 228, 229, 230, 231 - -	W. near limb, N. and S.
23		
24	226, 228, 229, 230, 231, 232, 233	E. on a line with 233. Near limb, two distinct patches more N.
25	229, 230, 231, 233, 234 - -	S.E. conspicuous f. and s. of 234, also N.E.
26	229, 230, 231, 233, 234 -	S.E. f. 234, numerous.
27	229, 230, 231, 234 - -	S.E.
28	229, 230, 235, 236, 237 -	N.E. Small patch far from limb, and 3° to 13° S. Position of train.
29	229, 235, 236, 237, 238, 239	E. 8° to 17° S. N.W. numerous, and S. of 229.
30		
31		

NOVEMBER 1895.

Day.	Groups of Sun-spots.	Faculae.
1	236, 237, 240 - - -	E. 2° to 17° N.; 14° to 30° S. f. Group 237 to limb. W. numerous N. and S.
2	236, 237, 241, 242 - -	E. extensive to the N.
3	236, 237, 241, 242 - -	N.E. and S.E. f. 242, N.W.
4	236, 237, 241, 242 - -	E. 5° to 33° S. W. 7° to 25° N.; 5° to 23° S.
5	236, 237, 241, 242 - -	E. f. 242. W. to to the N. and S.
6	236, 241, 242, 243 - -	E. 9° to 18° S. W. 13° to 33° S.
7		
8	236, 241, 242, 243, 244 - -	E. 10° to 20° N. faint. W. 8° to 18° S.
9	241, 242, 243, 244 - -	E. to the N. and far S. of 244. W. conspicuous to the S.
10	241, 242, 243, 244, 245, 246 - -	E. far S. faint. W. 0° to 15° N.; 5° to 35° S.
11	242, 243, 244, 245, 246 - -	E. near limb, sweeping to the S. a W. 0° to 25° N.; 0° to 34° S.
12	242, 243, 244, 245, 246 - -	E. bright patches to the S. W. s. f. 242.
13	243, 244, 245, 246, 247 - -	E. 7° to 25° N. W. 0° to 34° S. far from limb.
14	243, 245, 246, 247, 248.	
15	245, 246, 247, 248 - -	E. a patch far from limb N. 0° to 12° S. W. 3° to 12° S. and 18° to 28°.
16	245, 246, 247, 248.	
17	246, 247, 248, 249 - -	E. 13° to 35° N. W. 10° to 25° N.
18	247, 248, 249, 250 - -	E. 0° to 22° S. W. 0° to 25° N.; 0° to 25° S.
19	247, 248, 249, 250, 251, 252 - -	E. 0° to 22° S. W. on a line with 247.
20	247, 248, 249, 251, 252 - -	E. 2° to 18° N.
21	247, 248, 249, 251, 252, 253 - -	E. 0° to 17° N.; 5° to 20° S. far from limb. W. 13° to 20° S. One or two very small spots. Long. 228°. Lat. 20° S.
22	248, 249, 251, 253.	
23	248, 249, 251, 253, 255 - -	E. conspicuous from equator southwards. A patch p. 248 N.W.
24	249, 251, 253, 254, 255 - -	E. 0° to 17° N.; 0° to 16° S. W. 0° to 22° N.; 0° to 5° S.
25	249, 251, 253, 254, 255 - -	E. 8° to 20° N.; 5° to 23° S. W. 0° to 20° N.; 0° to 4° and 8° to 20° S.
26		
27	251, 253, 255A, 256 - -	Two very small spots N. f. not numbered.
28	251, 255A, 256 - -	N.E. far from limb and S.E. N.W. and near equator S.W.
29	251, 255A, 256, 257 - -	E. p. 257 and 258. W. region of 253.
30	253, 255, 256, 257, 258 - -	E. f. 257. S.W. region of 253.

DECEMBER 1895.

Day.	Groups of Sun-spots.	Faculae.
1	256, 256A, 257, 258, 259 " -	E. 6° to 22° N.; 3° to 28° S. W. 0° to 20° N.; 8° to 24° S. very extensive.
2	256, 256A, 257, 258, 259, 260 " -	Nearly same position as yesterday.
3	256, 256A, 257, 258, 259, 260, 261 -	E. 3° to 12° S. and 18° to 28° . W. 2° to 22° S.
4	257, 258, 259, 260, 261 " -	E. 0° to 8° S. W. 2° to 13° S.
5	257, 258, 260, 261, 262 " -	E. region of 261. W. 17° to 25° S.
6		
7	257, 258, 259, 260, 261, 262.	
8	257, 258, 259, 260, 261, 262, 263 -	N.E. W. 10° to 30° S.
9		
10		
11	258, 260, 262, 264 " -	E. 10° to 20° N. W. 5° to 20° N.; 5° to 30° S.
12	262, 264 " -	W. 17° to 27° S.
13	262, 264.	
14		
15	262, 264, 265 " -	E. 0° to 22° S. W. 0° to 32° S.
16	264, 265, 266.	
17	265, 266, 267.	
18	265, 266, 267 " -	E. extensive S. of equator.
19	265, 266, 267 " -	E. 7° to 28° N.; 6° to 23° S. W. 10° to 28° N.; 8° to 30° S.
20	265, 266, 267, 268 " -	E. 6° to 10° S.
21	265, 266, 268, 269 " -	E. numerous N. of 268, and f. 269.
22	265, 266, 268, 269 " -	E. region of 268, and far N. of it.
23	265, 266, 268, 269, 270 " -	E. region of 270, and far N.
24		
25	265, 266, 268, 269, 270, 271.	
26		
27	266, 268, 270, 271, 272 " -	E. Numerous S. One very bright patch N., region of 272.
28	268, 270, 271, 272, 273, 274 " -	W.N. and far to the S.
29	270, 271, 273, 274, 275 " -	E. p. 274, far from limb. W. small patches far from limb also.
30	270, 271, 273, 274.	
31	270, 271, 273, 274, 276, 277, 278, 279 -	S.W.

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LEDGER.

- Jan. GROUP 1. *Long.* 254°. *Lat.* 5° N.
 1. A small spot near W. limb. (Group 270 of December 1893.)
- Jan. GROUP 2. *Long.* 233°. *Lat.* 3° S. (Group 275 of 1893.)
 1. A considerable spot near W. limb.
- Jan. GROUP 3. *Long.* 228°. *Lat.* 31° S.
 1. A penumbral spot near W. limb.
- Jan. GROUP 4. *Long.* 200°. *Lat.* 12° S.
 1. A normal spot with two nuclei.
 2. Little change.
 3. Penumbra nearly equal on both sides.
 4. Close to W. limb.
- Jan. GROUP 5. *Long.* 189°. *Lat.* 13° S.
 1. A compound spot, or rather two similar spots, in close proximity, penumbra streaming upwards. Two of the nuclei dense. Much altered since December 30, 1893.
 2. Merged into one spot; major axis 1° of arc.
 3. Dividing into three or four sections.
 1. Sections fewer, two or three conspicuous sharp nuclei, near W. limb.
- Jan. GROUP 6. *Long.* 183°. *Lat.* 14° S.
 1. A compound spot, following group 5, in two divisions, nuclei small, numerous.
 2. Smaller, no division, penumbra gaping in front.
 3. More regular, two principal nuclei.
 4. Penumbra wanting on the s.p. side.
 5. Near W. limb.
- Jan. GROUP 7. *Long.* 171°. *Lat.* 8° S.
 1. A large spot past the centre of disk, more normal than on December 30, 1893. Nucleus entire, outliers very inconspicuous.
 2. Little change. One outlier.
 3. Outliers more numerous.
 4. Outliers to the N. and S.
 5. Penumbra nearly equal on both sides.
 6. Very near W. limb at noon.
- Jan. GROUP 8. *Long.* 159°. *Lat.* 9° S.
 1. A large compound spot, much changed since December 30, 1893 (group 281), when it was almost normal with a pair of large nuclei. Now in process of separation, a train of smaller penumbral spots sweeping round it to the S.
 2. In three nearly equal sections. The most p. of the outliers forming one. The f. quite disconnected. The largest of the nuclei, to the N., bridged. Two miniature streams of dots.
 3. Still trifid, but less compact, three conspicuous nuclei. The f. outliers smaller but more numerous.
 4. Three spots, quite separate, the nucleus of the northerly spider-like, the s. p. horseshoe shaped, the f. double. Outliers decreasing.
 5. Northerly spot normal, the other two fast fading.
 6. All smaller.

Jan. GROUP 9. *Long.* 156° to 153° . *Lat.* 15° to 17° N.

1. A few very small spots in two sets.
2. Three, forming a triangle.

Jan. GROUP 10. *Long.* 150° . *Lat.* 18° S.

1. A very small nebulous spot.
2. No change.
3. No change.

Jan. GROUP 11. *Long.* 144° . *Lat.* 10° S.

1. A faint little spot, resembling 10.
2. No change.
3. Two dots in addition.

Jan. GROUP 12. *Long.* 116° . *Lat.* 10° S.

1. A small spot with very slight penumbra.
2. Smaller.
3. More in number.
4. Two very small spots.

Jan. GROUP 13. *Long.* 107° . *Lat.* 8° S.

1. A small, faint spot, resembling 12.
2. A pair.

Jan. GROUP 14. *Long.* 98° . *Lat.* 15° S.

1. Another small, faint spot, resembling 12 and 13.
2. No increase.

Jan. GROUP 15. *Long.* 90° to 82° . *Lat.* 21° to 23° N.

2. A little spot in the midst of faculae.
3. A stream, the most f. only with penumbra.
4. More extended, almost a zigzag, final spot with double nucleus.
5. More in a line, the final one-sided.
6. The most p. larger than the final; intermediate small, zigzag.
7. Leading spot crescented, final dispersed.
8. Leader decreasing.
10. No details.
11. Two penumbral spots near W. limb.
12. One spot close to W. limb.

Jan. GROUP 16. *Long.* 50° . *Lat.* 14° S.

3. A spot near E. limb, nucleus divided; a smaller spot at some distance p.
4. Normal, nucleus double.
5. Nucleus triple.
6. Penumbra gaping on the f. side; a few outliers p.
7. Almost split in two. Area 1,006 square seconds.
8. Little change.
10. More connected.
11. Just severed; the first a copy in miniature of the large one, having double nuclei and the penumbra on opposite sides.
12. Large spot still a close pair, the two p. pairs fragmentary and widely separated.
13. Pairs further apart.
14. The large spot completely severed. The small pairs dispersed.

Jan. GROUP 17. *Long.* 48° to 44° . *Lat.* 15° to 17° N.

6. A triangular-shaped group of small spots, one penumbral.
7. No details.
8. Spots all very small.

Jan. GROUP 18. *Long.* 18°. *Lat.* 26° N.

6. A spot near E. limb, penumbra on the p. side; two smaller f.
7. No details.
8. One principal spot.
10. Not seen.
11. Four small spots, one with slight penumbra.
12. Two spots.
13. Little change.
14. One spot.

Jan. GROUP 19. *Long.* 123°. *Lat.* 4° N.

6. A pair of very small spots in the p. hemisphere.

Jan. GROUP 20. *Long.* 338°. *Lat.* 12° S.

10. A few little spots.
11. Small spots and dots in a semicircle.
12. A penumbral spot, nuclei beaded, a few dots and one small spot f.
13. Circular, much dwindled.
14. A pair of small spots and a few dots, followed by two more pairs at equal distances.

Jan. GROUP 21. *Long.* 336°. *Lat.* 2° S.

10. A penumbral spot not far from E. limb (a return spot).
11. Normal.
12. Little change.
13. Circular.
14. Nucleus more uneven. Area 600 square seconds.
15. Normal.
16. Little change.
17. Rather more jagged.
18. Rather decreasing.
19. More tapering to the N.
20. Normal.

Jan. GROUP 22. *Long.* 325° to 318°. *Lat.* 10° to 16° S.

10. A penumbral spot at a little distance from E. limb.
11. A large spot with sharply divided nucleus, followed by a swarm of little dark ones.
12. Nucleus with sharp fissures on the f. side, penumbra drawn out in the same direction and ending in a tiny stream of dots.
14. Much increased, nucleus angular with a great expanse of penumbra eastward, a collection of dark nuclei in place of the dots, many of them wedge-shaped. To the N. a small secondary stream.
15. Further increase and amazing change, the denser nucleus of yesterday shattered into six or seven fragments, the penumbra streaming to the W. as well as to the E., where it now forms two branches, embracing and connecting the little dark nuclei. Closely N. f. is a normal spot with bridged nucleus, length 45". Secondary stream decreasing.
16. General outline squarer, the normal spot appears to have coalesced with the other portions of the group, but no particulars were obtained.
17. Further change. S. p. are three large nuclei and some narrow fissures. A great extent of penumbra to the N., surrounding what was before the normal spot. The f. portion has also more penumbra, the two branches of the 15th spreading out laterally. Major axis more than 2' of arc. Area 1,900 square seconds. No secondary stream.
18. One of the three large nuclei serpentine and nodular, the others breaking up, a new one has appeared to the N.
19. Nuclei more equalised. Five of the p. form almost a semicircle. The f. portions are on the wane.
20. Four principal nuclei, the p. portions are becoming more detached.
21. Nearing W. limb.

N.B.—The Longitude was nearly the same as the large equatorial group of January 1893.

Jan. GROUP 23. *Long.* 310°. *Lat.* 12° N.

11. A large compound spot near E. limb.
12. Normal, many fragments to the S.
13. Penumbra cut off on the f. side.
14. Fragmentary spots increasing. Area of the whole 1,380 square seconds.
15. Nucleus broken up to the E. Some irregular spots f. mixed with dots.
16. New outliers p.
17. Large spot, pear-shaped, a swarm of small outliers surrounding it, one only with penumbra.
18. Forked at the extremity. Outliers to the N.
19. No details.
20. Normal. No outliers observed.
21. Little change.

Jan. GROUP 24. *Long.* 346°. *Lat.* 6° to 8° N.

12. A pair of faint spots some distance apart.
13. Only just visible.

Jan. GROUP 25. *Long.* 284°. *Lat.* 4° N.

13. A spot near E. limb, penumbra on the p. side.
14. Nearly normal, some small irregular spots f.
15. Nucleus double, a tiny pair s. f.
16. Little change.
17. Split in two, many dots n. and s. f.
18. Re-united, three nuclei.
19. Four nuclei; four outliers.
20. Group triangular.
21. One principal spot, penumbra on the s. f. side.
23. Reduced to a very small spot.

Jan. GROUP 26. *Long.* 270° to 262°. *Lat.* 15° S.

14. A compound spot near E. limb.
15. Nucleus very large, a patch of penumbra apparently torn off on the f. side, several smaller spots f.
16. F. spots more in number.
17. Normal, 1' of arc in length, nucleus dense, two lobed; a wide stream of very small spots f.
18. Nucleus bridged, area 1,600 square seconds, f. spots decreasing.
19. Nucleus double.
20. Nucleus curved, outliers fewer.
21. No radical change.
23. Normal.
24. Little change.
25. Near W. limb.
26. Penumbra nearly equal on both sides.

Jan. GROUP 27. *Long.* 260°. *Lat.* 6° S.

14. A normal spot very near E. limb.
15. Penumbra nearly equal.
16. Little change.
17. A stream of dots n. f.
18. Nearly circular. Area 1,000 square seconds.
19. F. spots increasing.
20. Little change.
21. F. spots very small.
23. Circular, no outliers.
24. Little change.
25. No details.
26. Near W. limb.

Jan. GROUP 28. *Long.* 255°. *Lat.* 2° N.

14. A spot close to E. limb (at 12^h 43^m).
15. Nearly normal. This spot with 26 and 27 were striking objects, being somewhat similar, and stretching at nearly equal distances from the equator N. and S.
16. Little change.
17. Two nuclei.
18. Little change. Area 900 square seconds.
19. One f. spot.
20. Little change.
21. More elongated, nucleus jagged.
22. Nucleus bridged.
24. Nucleus double.
25. Little change.
26. Decreasing.

Jan. GROUP 29. *Long.* 233°. *Lat.* 4° S.

17. A penumbral spot near E. limb; a smaller spot p.
18. Nucleus jagged, penumbra with an arm to the S.
19. Normal.
20. A small spot to the N.
21. Circular, a few dots only surrounding.
23. Nucleus fimbriated; a tiny cluster of dots f. at some distance.
24. Little change.
25. A few outliers.
26. Little change.
27. Nearing W. limb.
28. Decreasing.

Jan. GROUP 29A. *Long.* 298°. *Lat.* 16° S.

18. A few very small spots f. Group 22 at same distance.
19. No increase.
20. Little change.
21. Very few.

Jan. GROUP 29B. *Long.* 282°. *Lat.* 23° S.

18. Two or three very small spots.
19. Much the same.

Jan. GROUP 30. *Long.* 264° to 257°. *Lat.* 15° N.

18. A single dot.
19. Not seen.
20. Four little spots with slight penumbra.
21. Leading spot nearly normal, a stream of small ones f.
23. In a.m. leader with sharply fissured nucleus, the f. very irregular.
In the p.m. leader bridged, the f. more united.
24. Details wanting.
25. Leader more entire, the f. decreasing.
26. Both much reduced.

Jan. GROUP 31. *Long.* 202°. *Lat.* 9° S.

20. A little spot with slight penumbra.
21. A few outliers to the S.
23. Still small, but crossed by bridges.
24. No increase.

Jan. GROUP 32. *Long.* 189° to 184°. *Lat.* 16° S.

23. A few small spots.
24. In a cluster.
25. Fewer.
26. One spot.

Jan. GROUP 33. *Long.* 175°. *Lat.* 6° S.

21. A normal spot near E. limb, a smaller one f.
23. Nucleus cleft and pointed.
24. No details.
25. Almost circular.
26. Half-moon shaped, with small nuclei, major axis about 30".
27. Again entire, two nuclei.
28. Two small spots f.
29. Little change.
30. Nucleus single, penumbra more on the p. side.
31. Decreasing.

Feb.

1. Little change.

Jan. GROUP 34. *Long.* 208° to 199°. *Lat.* 30° S.

24. Two small spots not far from the centre of disk.
25. More in number.
26. A stream, wider at the end.
27. One of the final spots much increased, with many small nuclei.
28. Final spot split in two, nuclei and dots streaming from it. Leader enlarging, but with no penumbra, and singular in form.
29. Spots in two sets, reduced; immersed in faculæ.
30. Hardly distinguishable, faculæ in a long curve.

Jan. GROUP 35. *Long.* 156° to 142°. *Lat.* 10° to 18° N.

23. Three small spots, observed at 4 p.m., but not in the forenoon.
24. Two, with a little penumbra.
25. More numerous, in two sets, N. and S. of each other, penumbra almost entirely absent.
26. Still more numerous, the spots to the N. in a wide stream, as many as 25. Those to the S. in two sets, curved.
27. Some of the N. spots much larger, interspersed with small nuclei and dots. Those to the S. also more developed.
28. Spots to the N. in a narrow curved stream, fewer and smaller.
29. Two irregular spots to the N., followed by a zigzag of very small ones, vertical. Those to the S. also dwindling.
30. Decreasing rapidly, to the N. only four or five.
31. One faint spot to the N. Two, with a few dots, to the S.

Feb.

1. One spot, small but normal.
3. Very small, a fainter one to the S.

Jan. GROUP 36. *Long.* 159°. *Lat.* 9° S.

25. Two small spots f. Group 33.
26. A leading spot, pear-shaped, nucleus forked, length 40". Small outliers f.
27. Nucleus with a hook at the end, outliers only dots.
28. Nucleus double, dots in a tiny cluster.
29. Light round the nucleus, especially to the N. No outliers seen.
30. Nucleus still with light to the N.
31. Normal, much resembling Group 33.

Feb.

1. Little change.

Jan. GROUP 37. *Long.* 212° to 208°. *Lat.* 11° N.

25. A miniature group, W. of centre of disk.
26. A few tiny spots p., a very small normal spot f.
27. Three dots following each other in a line.

Jan. GROUP 38. *Long.* 83° to 80°. *Lat.* 12° N.

29. Two very small spots in the midst of faculæ near E. limb.
30. One spot.
31. Two, very small.

Feb.

1. Not observed.
3. A triangular group of small spots, two only with slight penumbra.
4. Rather more numerous.

Jan. GROUP 39. *Long.* 77° to 66° . *Lat.* 16° to 19° S.

29. Two or three very small spots near E. limb.
30. A few more f.
31. About eight in a wide stream.

Feb.

1. A compound spot p., a few small ones f.
3. The p. opening to the E. with fragmentary sputterings, major axis $45''$, nucleus double. Another spot f. about $30''$, major axis with nuclei in a crescent, many outliers between the two.
4. Nucleus of p. crescented.
5. P. more circular. Nucleus tripartite. At 1.13, Prof. Pereira found that the opening still left had become nearly closed after little over an hour's observation. The f. much elongated, outliers fewer but larger. A pair of small spots at some distance n.f.
7. The p. more normal, nucleus double, f. much diminished.
8. The p. with three nuclei, penumbra splitting to the N. The f. with only a little penumbra to the E. Outliers very few. About five n.f. spots.
9. The p. with two nuclei, penumbra still opening to the N. The f. still dwindling.

Feb. GROUP 40. *Long.* 139° . *Lat.* 3° N.

1. Two small spots past the centre of disk.
3. A cluster.
4. About three near W. limb.
5. One spot much larger. Close to W. limb at 12.48.

Feb. GROUP 41. *Long.* 20° . *Lat.* 15° N.

3. A normal spot.
4. Little change.
5. Almost circular, nucleus fimbriated, area 350 square seconds.
7. No details.
8. Breaking up, nuclei small, penumbra cut off on the p. side, a portion having apparently been detached, nearly central.
9. Fast decreasing.

Feb. GROUP 42. *Long.* 9° to 3° . *Lat.* 15° N.

5. A little train of irregular spots.
7. Two prominent spots.
8. Train curved, three spots with penumbra, the first almost normal, the two last as if one had burst asunder.
9. All much decreased.
10. About three spots.
11. A circular one p., a very small one f.
12. One very small p. and two dots f.
13. A tiny pair near W. limb, many faculæ.

Feb. GROUP 43. *Long.* 333° . *Lat.* 10° S.

5. Several spots near E. limb.
7. A penumbral spot followed by smaller ones.
8. A diffuse cluster, two leading spots with penumbra on opposite sides, N. and S., the larger $40''$, major axis, the rest hardly larger than dots.
9. More scattered, three penumbral spots, all one-sided.
10. Leaders smaller but more normal, a regular zigzag of dots n.p.
11. One of the leaders much reduced, the other with crescented nucleus, the zigzag is now a stream of almost invisible dots.
12. A fan-shaped spot with a few neighbouring dots.
13. Little change.
14. Penumbra only to the S. Nucleus crescented. One dot near, two at a distance.
16. Three or four very small spots in a line.

Feb. GROUP 44. *Long.* 323°. *Lat.* 16° S.

7. A small penumbral spot f. Group 43. (Position of Group 22).
8. Normal.
9. Nucleus curved.
10. More elongated, major axis 20".
11. Nucleus tapering at both ends.
12. Breaking up, much diminished.

Feb. GROUP 45. *Long.* 339°. *Lat.* 18° N.

8. Two little spots, f. each other (n.f. Group 42).

Feb. GROUP 46. *Long.* 306°. *Lat.* 11° N.

8. A normal spot, about two days from E. limb.
9. Nucleus partly curved.
10. Tapering at the end, nucleus dividing; two small penumbral spots f.
11. Normal, nucleus fimbriated, f. spots disjointed.
12. F. spots very small, but more numerous.
13. Nearly circular, f. spots in four sets, nearly equidistant.
14. Nucleus two-lobed, f. spots nearly gone, a few n.p.
16. Nucleus bridged, no outliers.
17. Decreasing.
18. Nucleus divided, apparently breaking up.

Feb. GROUP 47. *Long.* 300°. *Lat.* 4° N.

8. A small spot with slight penumbra, not far from E. limb.
9. No increase.
10. Smaller.
11. Little change.
12. Two or three tiny dots in nearly the same position.
13. One dot.

Feb. GROUP 48. *Long.* 268°. *Lat.* 14° S.

10. A penumbral spot near E. limb.
11. Penumbra nearly equal on the p. and f. side.
12. Two nuclei.
13. Circular.
14. Nuclei beginning to sub-divide.
16. Two nuclei, unequal in size.
17. One nucleus, a small spot f. Area 500 square seconds.
18. Nucleus bridged.
19. Nucleus divided, penumbra also splitting.
20. Little change.
21. In two parts.

Feb. GROUP 49. *Long.* 266°. *Lat.* 17° N.

10. A large spot very near E. limb (at 1 p.m.)
11. Normal.
12. Penumbra nearly equal on both sides.
13. Little change.
14. Nucleus fimbriated. Area 800 square seconds.
16. Little change.
17. Little change.
18. Penumbra wider to the N., a small spot p.
19. Nucleus dividing.
20. Little change.
21. Nucleus entire.
22. Very near W. limb.

Feb. GROUP 50. *Long.* 318°. *Lat.* 23° S.

9. Two extremely small spots f. Group 44.
10. A swarm of small spots.
11. A miniature stream.

Feb. GROUP 51. *Long.* 346° to 340° . *Lat.* 18° to 23° N.

10. Two little pairs with a few dots widely scattered.
11. A small nebulous spot, dots f. in a line.
12. A few dots widely separated.
13. A very small spot p., a nebulous one and a minute cluster f.
14. Two little pairs.

Feb. GROUP 52. *Long.* 344° . *Lat.* 10° N.

13. Three very small spots S. of group 51.

Feb. GROUP 53. *Long.* 321° to 313° . *Lat.* 6° to 9° S.

11. A semi-circular group of little spots.
12. A cluster, almost entirely composed of dots, 24 at least.
13. A stream, $2'$ of arc in length, no increase in area of dots.
14. Fainter, constituents fewer. Three dots s.p., very widely separated.
16. Dwindling.
17. One spot.
18. Near limb.

Feb. GROUP 54. *Long.* 239° to 232° . *Lat.* 12° N.

16. Three spots with a little penumbra.
17. Little altered.
18. A stream, the leader only penumbral, the rest very small. A tiny spot f. at some distance.
19. Leader more normal, tapering, a miniature zigzag of dots, quite distinct.
20. Leader oval, dots almost gone.
21. Much smaller.
22. Still decreasing.

Feb. GROUP 55. *Long.* 202° to 197° . *Lat.* 24° to 29° S.

16. A spot near E. limb with curved nucleus and penumbra on the f. side, a small one in advance, apparently once forming part of it.
17. Almost severed, forming three spots.
18. A cluster, somewhat triangular in form, composed of many small sharp nuclei and a fair amount of penumbra with outlying spots and dots.
19. More dispersed, one spot larger than the rest.
20. The largest spot more circular, the rest all small but quite as numerous, some new since yesterday.
21. An immense number of little spots and dots, many of them angular, forming a wide elongated stream, hardly any with penumbra.
22. Spots quite as numerous but more scattered.
23. Greatly diminished, less than half the number.
24. Still more attenuated, spots very faint.

Feb. GROUP 56. *Long.* 188° . *Lat.* 32° S.

16. A spot near E. limb with large curved nucleus, and a singular loop in the penumbra on the n.f. side.
17. More nuclei, the loop remaining.
18. Large nucleus still curved and very jagged on the p. side, showing a difference in the depth of tint. Many smaller and very irregular nuclei, penumbra still opening on the f. side.
19. Nucleus bridged; penumbra encircling the whole.
20. Nucleus with a long narrow fissure streaming to the W. from the bridge. A black hole in the middle of the large chasm, the whole an enormous spot, in form quadrangular. Area 6,500 square seconds.
21. Nucleus more dense, fimbriated on both sides, the black hole very conspicuous with curved points of cyclonic shape to the W. of it. The whole very complicated, smaller nuclei more numerous, but decreasing in size.

Feb. GROUP 56—*continued*.

22. On the central meridian, a striking difference in the tint of the p. portion of the nucleus, the darker evidently identical with the black hole (see "British Astronomical Association Journal," Vol. IV., No. 7, p. 300). The large nucleus diminishing since yesterday, but with a gigantic acanthus leaf of white photospheric matter, its stalk fixed in the middle of the spot and its blades turned towards the black nucleus; a cyclonic movement N.W.S.E. is conspicuous. Length 47,620 English miles.
23. Nucleus very jagged, in shape resembling a lobster, the s.f. part broken up, deeply fissured, and bent back as it were at right angles, the whole more perforated and containing an immense amount of detail.
24. A bridge across the densest part of the nucleus, the bent portion severed, smaller nuclei very variable in shape, some of the exterior ones dot-like.
26. Large nucleus broken up into several parts, the S. portion is now quite distinct and lengthened out.
27. Much fore-shortened and divided, the S. part a string of little nuclei with penumbra to the S.
28. Decreasing.

Feb. GROUP 57. *Long.* 153°. *Lat.* 26° S.

18. A penumbral spot, very near E. limb at 2 p.m.
19. Nucleus divided.
20. Nuclei more separated, small portions broken off.
21. A small spot on the f. side, apparently thrown out.
22. The uppermost of the two nuclei larger than the lower, which crescented. No outlying spot.
23. Major axis 50". Lowermost nucleus linear.
24. Little change.
26. No details.
27. Nuclei in a quatrefoil.
28. Nucleus entire.

March.

2. Penumbra on the p. side.
3. Penumbra to the N.

Feb. GROUP 58. *Long.* 151°. *Lat.* 3° N.

19. A small penumbral spot near E. limb.
20. Penumbra on the f. side.
21. Normal.
22. Two small spots to the S.
23. No change. Major axis about 30".
24. Decreasing.
26. No details.
27. Still decreasing, nucleus divided, one or two outliers.

Feb. GROUP 59. *Long.* 143°. *Lat.* 16° S.

19. A small spot near E. limb preceded by a few dots.
20. Normal, penumbra wider on the f. side, a small spot p.
21. Nucleus breaking up.
22. Nucleus more entire, a few small outliers, the p. spot gone.
23. Nucleus again dividing, a rent also in the penumbra, five dots f. close together.
24. Much elongated equatorially, many small nuclei, two dots f.
26. No details.
27. Both nucleus and penumbra severed, one spot and some tiny dots f.
28. The two portions smaller but more widely separated, the f. with two nuclei.

March.

2. One spot with penumbra s.p., the other almost gone.

Feb. GROUP 60. *Long.* 261°. *Lat.* 4° to 5 S.

20. A number of very small spots in a quadrangular group.
21. Spots in three sets following each other.
22. One larger spot near W. limb.

Feb. GROUP 61. *Long.* 176° to 171°. *Lat.* 16° S.

21. A few very small spots.
22. A loose cluster, somewhat elliptical; spots all small interspersed with dots.
23. Two compound spots, 5° part, with major axis 30'' and 20''. Dots between them.
24. The leader more normal, the f. triangular, more outliers, f.
26. Decreasing.
27. Leader normal. A forward impulse has taken place between the 24th and 27th of 5°. The f. broken up. The whole group elongated.
28. Leader much diminished.

Feb. GROUP 62. *Long.* 128°. *Lat.* 25° S.

27. About three little spots near each other, three more f.
28. One spot larger.

Mar.

2. Leading spot, with penumbra on the p. side only, major axis 20''. Some dots f. more to the E.
3. Much diminished.
4. One very small spot.

Feb. GROUP 63. *Long.* 98°. *Lat.* 10° S.

27. A small black spot without penumbra, two still smaller f. at a distance.
28. Another round, black spot (like the shadow of one of Jupiter's satellites), 6° more to the S.

Mar.

2. No increase, the f. spots have disappeared.

Mar. GROUP 64. *Long.* 92°. *Lat.* 16° S.

2. A faint spot with slight penumbra, not far from the central meridian.
3. A pair of dots to the N. at some distance.
4. Not seen.
5. A miniature pair.
6. Near W. limb, very small.

Mar. GROUP 65. *Long.* 9°. *Lat.* 8° N.

4. Four little spots at some distance from E. limb.
5. A stream, components hardly larger than dots.
6. The p. dots, five of which were close to each other, have become an oval spot, in length 35'', with many small nuclei and penumbra s. f. The f. dots larger. Some hours later the nucleus had increased and become forked, the f. dots amalgamating and drawn out in a double row.
7. Nucleus elongated, a portion at the end as if torn off, the s. f. spots vanishing.
8. Leader more normal, the disjected portion with three nuclei and curved in an opposite direction. Area 720 square seconds.
10. Nucleus of leader broken up, a small irregular spot f., apparently the disjected portion.
11. Penumbra on the p. side, f. spot very small.
12. Smaller, nebulous, solitary.

Mar. GROUP 66. *Long.* 358°. *Lat.* 22° S.

4. A very small spot in the midst of faculae.
5. A few more p.
6. Spots in an elliptical group. Very small.
7. Six dots in a stream.
8. Increased in area and more confluent.

Mar. GROUP 67. *Long.* 331° to 325° . *Lat.* 3° to 4° S.

5. A small spot not far from E. limb.
6. Two little black spots.
7. The p. with nucleus out of proportion to the penumbra, three smaller f.
8. P. with double nucleus, still but little penumbra, one f.
10. Great increase, leader two-lobed with accompanying dots, more f. at a little distance mixed with penumbra.
11. Leader with penumbra only on the p. side, a wide stream of dots only f.
12. Leader with many small nuclei, the f. dots in curves.
13. Leader trifold, one penumbral spot f.
14. Spots small, including the leader, the most f. dots again forming an ellipse.
15. Spots increasing, but without penumbra.
16. In two sets, a great amount of faculae.

Mar. GROUP 68. *Long.* 24° . *Lat.* 9° S.

7. Two little black spots and three dots.
8. Two dots.

Mar. GROUP 69. *Long.* 335° . *Lat.* 11° S.

- 7 Three dots, one very faint. (Between Group 67 and 70.)

Mar. GROUP 69A. *Long.* 337° . *Lat.* 18° S.

10. A few very small spots near the centre of disk.
11. Little change.
12. Three spots, another p.
13. One spot.

Mar. GROUP 69B. *Long.* 325° . *Lat.* 15° S.

10. A few dots.
11. One small nebulous spot.
12. Decreasing.
13. Little change.
14. Three sets of dots.
15. One small irregular spot.
16. Two dots, near W. limb.

Mar. GROUP 70. *Long.* 313° to 309° . *Lat.* 15° N.

7. A pair of small dark spots near E. limb.
8. Confluent, forming one spot, penumbra on the f. side.
10. Large, normal. To the S. a stream of little spots following the contour of the main one.
11. Small spots in front with penumbra at their head, comet-like, the f. swamped in the penumbra of the main one, but still visible as a narrow line.
12. Main spot very large, double, the two nuclei forming a perfect pair, but pointing in opposite directions, the comet-like spot separated, a few scattered outliers.
13. Main spot drawn out equatorially, the two large nuclei being now in a line. Penumbra beginning to divide between them, major axis $1' 15''$.
14. Two separate spots, each nearly normal. No outliers besides the p. spot, which has penumbra still only in front.
15. More widely separated. Nuclei splitting up. A few outliers.
16. No radical change.
17. Decreasing.
18. Near W. limb, diminished. Three spots, the two f. without penumbra.

Mar. GROUP 71. *Long.* 270° . *Lat.* 4° S.

10. A penumbral spot near E. limb.
11. Penumbra splitting on the f. side.
12. Nearly normal, a small fragment apparently thrown out.
13. Fragment more distant.

Mar. GROUP 71—*continued*.

14. Nearly circular, solitary.
15. Major axis 35''. Nucleus bridged.
16. Elongating.
17. A small spot n. f.
18. Decreasing.
19. One dot f.
20. Penumbra slight.
21. Much reduced, a small spot n. f. at some distance.

Mar. GROUP 72. *Long.* 263°. *Lat.* 16° N.

10. A small penumbral spot near E. limb.
11. Little change.
12. Normal.
13. Penumbra splitting on the f. side.

Mar. GROUP 73. *Long.* 345°. *Lat.* 6° N.

13. A small nebulous spot more than half of sun's radius from centre.

Mar. GROUP 74. *Long.* 321° to 315°. *Lat.* 5° N.

13. A pair of little spots.
14. Larger, dark, three p. and one, in the form of a crescent, f.
15. Decreasing, again a pair, each double.
16. Dots only, in two sets widely separated.

Mar. GROUP 75. *Long.* 178°. *Lat.* 8° N.

17. A small spot not far from E. limb.
18. Penumbra very slight.
19. No penumbra.
20. Not seen.
21. One very small black spot.

Mar. GROUP 75A. *Long.* 144°. *Lat.* 26° S.

19. A very small normal spot.
20. A tiny semi-circular cluster.
21. One very small black spot.
22. Little change.
23. Three small spots in an isosceles triangle.
24. Two only.

Mar. GROUP 75B. *Long.* 171°. *Lat.* 32° S.

19. A very small spot at some distance from E. limb.

Mar. GROUP 76. *Long.* 133° to 126°. *Lat.* 7° N.

20. A compound spot, with a broken portion, only connected by a narrow isthmus, followed by two smaller ones.
21. A train, the leader more normal, but sphaclated on the f. side, the adjacent portion dissevered, one of the f. larger.
22. Two principal spots, the leader normal, the final one nearly double its area, with much penumbra, apparently from union with a p. spot.
23. Leader circular, but bridged and fimbriated, the final with large nucleus and penumbra in front still branching. Many sputterings and dots, three more distant.
24. Spots more connected and equalised, with a tendency to curves, the final one double.
25. Nearly central, spots separated, the leader and the final (now the largest) with dense nuclei, two smaller between. Outliers few.
26. Leader with divided nucleus, photospheric matter enveloping the p. part, the f. being veiled. Final spot much elongated.
27. Decreasing, leader broken in two, the final splitting centrally, a small black spot and a penumbral patch only remaining between. The dots to the N. have disappeared.
28. Fading away, the leading spots become two very small pairs. One of the f. still considerable, crescent shaped.

Mar. GROUP 76—*continued*.

29. The f. spot alone remaining, except dots which precede, and also issue from it on one side, the penumbra encircling three.
30. Still diminishing by dissection and reduction of boundaries, the severed parts seem to sink and dissolve in the photospheric ocean, leaving very small black dots which last some time.
31. Near W. limb. Still decreasing.

Mar. GROUP 77. *Long.* 101°. *Lat.* 20° S.

23. A little crescent-shaped spot and a dot f.
24. A black dot only.

Mar. GROUP 78. *Long.* 129°. *Lat.* 25° N.

24. Two small spots lying N. and S. of each other, with smaller ones between.
25. No drawing.
26. The two spots very black, dots f, the most northerly.

Mar. GROUP 78A. *Long.* 70°. *Lat.* 14° N.

26. A small black spot at some distance from E. limb, in the midst of faculae.

Mar. GROUP 79. *Long.* 57° to 46°. *Lat.* 9° N.

26. Two very small spots near E. limb.
27. A penumbral spot between four lesser ones.
28. A train, chiefly dots, one larger than the rest.
29. Spots drawn out in a line in single file, except the most p.
30. A leading spot of considerable size with one large nucleus and tiny ones to the N., the rest no longer continuous; at the rear a little star-shaped cluster.
31. Leader enlarged, with two nuclei and a wide bridge, a trail of small nuclei issuing from the n. f. side with branching penumbra, irregular sputterings follow in a zigzag.

April.

1. Leader nearly vertical, one nucleus much larger than the other, and close to it; sputterings amalgamating, two of them distinct spots, the larger nearly 30'' in length.
2. Leader 1' of arc in diameter, nuclei more equal, but narrowed and angular, penumbra extending on the n. f. side containing miniature nuclei, which suggest the absorption of neighbouring spots. More small outliers f.
3. Leader a huge normal spot, nucleus entire, the f. much dwindled, one only of any importance.
4. Nucleus tapering, the f. still on the wane.
5. Leader little changed, a small pair only f.
6. Signs of a division; penumbra nearly equal on the p. and f. side.
7. Close to W. limb at 10.45 a.m. A slight depression or flatness of the curvature of the limb was observed, possibly arising only from the difference in shade between the penumbra and the limbs.

Mar. GROUP 80. *Long.* 86° to 81°. *Lat.* 16° S.

27. A pair of small spots, three more f.
28. Two pairs, more widely separated.
29. One small spot.
30. A pair, dots between, and s. f.

Mar. GROUP 80A. *Long.* 36°. *Lat.* 22° S.

27. A small spot followed by a tiny group of three.
28. More widely separated.
29. One very small spot.
30. A pair, little sputterings between and s. f.

Mar. GROUP 81. *Long.* 39° to 27° . *Lat.* 17° to 22° N.

27. A small spot close to E. limb.
28. A cluster, very little penumbra.
29. Four principal agglomerations of nuclei and penumbra, besides dots and sutterings.
30. An enormous increase, two large compound spots, the p. (A.) with beautiful ramifications in the nucleus, the f. (B.) with penumbra chiefly confined to the E., and several nuclei, probably a combination of three spots seen yesterday; sutterings between the two.
31. Further increase. A. oval, nucleus almost entire, a stream of distinct spots, apparently offshoots from the pointed extremities, with linear nuclei stretching out, connecting it with the large f. spot B. which is also more consolidated, the nucleus with a black hole in it, and a bridge, while fissures, four in a row, stream from it on the n. p. side, penumbra curling round and encircling the whole. Area of both spots 4,000 square seconds.

April.

1. A. double, with two elongated nuclei lying N. and S. of each other. B. roughly triangular, composed of one large spot, nearly normal, with wedge-shaped nucleus and two portions just detached, the connecting stream dissolved, outliers few.
2. Crossing the central meridian. A. a wonderful mass of nuclei surrounded with penumbra, in form oblong. B. with the nucleus bridged in several places. One of the detached portions enlarged, a string of small nuclei curving round in front. Area of A. 2,800 square seconds. B. 3,000.
3. A. again consolidated with two large nuclei, one crescented the other somewhat pear-shaped. It appears to be turning round the nucleus to the N. as on a pivot, the one to the S. advancing to the W., thus causing the space between A. and B. to become wider; an irregular stream of sutterings almost connect it with B., which has undergone considerable change, the wedge-shaped nucleus being forked at one end and barred at the other, the severed portions decreasing.
4. A. almost split in two; the two nuclei quadrangular. B. still of great size, nearly equalling A., but more broken up on the p. side; the nuclei much altered in form.
5. A. breaking asunder towards the equator, the nucleus to the S. much narrowed. B. is in two sections almost at right angles to each other, with curved and divided nuclei. Few sutterings between.
(N.B.—A. has shown a retrogradation of 4° Long.)
6. A. a double spot only united on the f. side, "having turned completely round," the two nuclei still conspicuous, forming a semi-ellipse with the opening towards the limb. B. still more broken up. The f. nuclei deeply fissured; a wide vacant space in the centre.
7. A. near W. limb, the truncated half somewhat diminished. B. gradually dissolving and more separated.
8. A. invisible. B. fainter than yesterday.

April. GROUP 81. *Long.* 16° to 12° . *Lat.* 7° N.

5. Two little irregular spots some distance apart, f. Group 82.
6. Smaller.
7. Hardly more than dots.

Mar. GROUP 82. *Long.* 23° . *Lat.* 14° N.

28. A penumbral spot with two nuclei.
29. Penumbra gaping to the S.
30. The nucleus to the S. with a hook.
31. Normal, circular, two tiny spots f. at some distance.

April.

1. Little change, a few dots p. Distant spots not seen.
2. Area 450 square seconds. This spot seems beyond the region of activity occupied by Group 81.
3. A small spot f.
4. Another more distant.

Mar. GROUP 82—*continued*.

5. The more distant not seen.
6. Nucleus forked at the end, possibly from absorption of the adjacent spot.
7. Normal.
8. Penumbra nearly equal on both sides.

Mar. GROUP 82A. *Long.* 99°. *Lat.* 25° N.

28. Two tiny but very conspicuous pairs.
29. Dots only.
30. A very small spot and a tiny cluster of dots f.

Mar. GROUP 83. *Long.* 336°. *Lat.* 15° S.

31. A very small spot close to E. limb.

April.

1. Some outliers.
2. An irregular group, some spots with slight penumbra, a short trail f.
3. A little stream somewhat zigzag, one spot only penumbral.
4. Stream lengthened and expanded; the leader larger than the rest.
5. Two leading spots, stream more in a straight line.
6. Much increased, a mass of small spots, with penumbra and dots.
7. Spots larger, in two principal sections, no longer in a line, the most f. double.
8. Leading spots much smaller, the f. single but broken up with a few attendants.
9. The f. spot normal, solitary, penumbra confined almost entirely to the W. side; major axis 40'.
10. The p. spots gone, the f. bridged, two new ones at a little distance.
11. The f. normal, new ones very small.
12. Near W. limb, little change.

April. GROUP 84. *Long.* 69°. *Lat.* 12° N.

2. A pair of small spots p. Group 79, only observed on this date.

April. GROUP 85. *Long.* 0°. *Lat.* 28° S.

3. A little pair.
4. A wide pair.
5. One spot.
6. A pair with a tiny one f.
7. Two irregular penumbral spots.
8. Still larger, the f. double, nearly 45'' major axis, both with several nuclei.
9. More normal, the f. broken asunder, forming two spots.
10. Near W. limb, the two f. more equal.

April. GROUP 86. *Long.* 294° to 282°. *Lat.* 15° to 18° N.

4. A small normal spot.
5. Penumbra equal on both sides.
6. Little change.
7. A smaller penumbral spot f. with a few outliers.
8. Little change in the leader, but a complete train of small spots f., for the most part with penumbra.
9. Enormous increase in the f. Two principal spots, each more than 1' in length, the first very complicated, with nuclei much divided, streaming out at the extremity, the last with three nuclei, and vertical.
10. Much disintegrated, a wonderful train of fragmentary spots, two still predominating although much altered. Area 2,700 square seconds.
11. More compact.
12. General surface augmented, spots still much divided but in two sections. The vertical spot split up and turned to the equator.

April.

GROUP 86—*continued*.

13. First section more concentrated, with six nuclei circling round each other, the last very fragmentary, penumbral streamers between the two.
14. Slowly diminishing, the first section less concentrated.
15. Near W. limb.

April.

GROUP 87. *Long.* 339° to 329°. *Lat.* 11° to 13° N.

6. Two very small spots, three dots f.
7. Great increase, an irregular stream of about 10, parallel to the equator, one or two with penumbra.
8. Leading spot nearly normal.
9. Leader with a trail of dots f., two small spots further off.
10. Decreasing, the f. dots in a line, one distant spot.
11. One spot.

April.

GROUP 88. *Long.* 232°. *Lat.* 25° S.

8. A dot near E. limb.
9. Increasing.
10. Decreasing.

April.

GROUP 89. *Long.* 190° to 176°. *Lat.* 15° S.

12. A few small spots near E. limb.
13. Nearly normal, three dots s. f.
14. Nucleus triangular, five outliers.
15. Outliers larger.
16. Leading spot with two nuclei, the rest following in a double line, the last increased.
18. Leader broken up, the last with irregular nuclei, a few dots and penumbral patches between. Area 370 square seconds.
19. Leader more normal, the last spot dispersed and become a fragmentary cluster.
20. Leader splitting into three; the cluster condensed, with more penumbra.
21. Leader decreasing, the cluster is now a stream.
22. Leader vanishing, and instead of the stream a large spot with divided nucleus and penumbra only on the p. side. Area 600 square seconds.
23. Leader a tiny pair; f. spot in two sections, much disintegrated penumbra on the f. side.
24. The f. only visible.
25. One small spot close to W. limb at 9.54 a.m.

April.

GROUP 90. *Long.* 153°. *Lat.* 13° S.

14. A normal spot near E. limb, penumbra wider on the f. side.
15. Nucleus divided.
17. More normal.
18. Nucleus large, fimbriated, with a small one on the s. f. side, diameter 42".
19. Little change.
20. Outline irregular; two outlying dots.
21. Nearly circular.
22. Small nucleus now close to the large one.
23. Little change.
24. Small nucleus united to the large.
25. Small nucleus again disunited.
26. Near W. limb.
27. Close to limb, like a line.

April.

GROUP 91. *Long.* 152°. *Lat.* 6° S.

14. A very small spot N. of 90.
15. Little change.
17. Ditto.
18. Decreasing.
19. A dot s. f.
20. Very small.

April. GROUP 92. *Long.* 90° to 78° . *Lat.* 15° to 21° S.

19. A small normal spot near E. limb.
20. Penumbra wider on the f. side; a little nucleus on the edge. A few outlying dots.
21. A small spot f.
22. Fragmentary spots f. in a broad stream.
23. Vastly increased. Two large spots, the f. formed from one of the fragmentary ones of yesterday, exceeding the p. in area, with a curved nucleus.
24. Spots in a train, more confluent, the p. normal, the f. with two nuclei, one of them large and quadrangular, penumbra stretching out and enveloping the smaller followers now much enlarged. Area 2,400 square seconds.
25. Train less sinuous and more inclined to the equator; four principal spots, the p. with a tiny stream f., the others tapering, with wispy penumbra; very complicated.
26. Three principal spots, disconnected but more regular.
27. Again more dissected and intricate, the largest forked with a black hole in the nucleus. Many dots and outliers.
28. Greatly diminished; three spots still prominent.
29. Two prominent spots.
30. One larger than the rest.

May.

1. Near W. limb.

April. GROUP 93. *Long.* 90° to 80° . *Lat.* 29° S.

22. Two very small spots S. of Group 92.
23. A large cluster, forming a sort of double ellipse, the first and last spots larger than the rest which are sharp and unclear, in all about 24. Length $1' 30''$.
24. Spots more in a line and fewer, the first and last more normal.
25. Spots between the first and last decreasing.
26. The first and last only left, each with double nucleus.
27. Nuclei more irregular.
28. The first spot decreasing, the last reduced to a small pair.
29. Little change.
30. One small spot.

May.

1. Near W. limb two dots and a tiny pair f.

April. GROUP 94. *Long.* 61° . *Lat.* 18° S.

22. A small irregular spot following Group 92.
23. A little pair.
24. No change.
25. Not increased.
26. One very small spot.
27. A dot.

April. GROUP 95. *Long.* 55° . *Lat.* 12° N.

22. A normal spot near E. limb. (Return of Group 79.)
23. Nucleus bridged.
24. A small spot f.
25. Two nuclei, one large and pear-shaped.
26. Nucleus entire.
27. Nucleus jagged, with a black hole in it; more outliers s. f.
28. Nucleus bridged longitudinally.
29. Little change.
30. Normal.

May.

1. Nucleus indented on three sides.
2. More regular.
3. Little change.
4. Very near W. limb at 8.50 a.m.

April. GROUP 96. *Long.* 48°. *Lat.* 22° N.

22. A small spot n. of. 95.
23. Nucleus curved.
24. In the form of a C. Area 200 square seconds.
25. Much divided.
26. Double.
27. A few outliers.
28. Decreasing.
29. A little pair.
30. Very small.

May.

1. Nucleus double, but no increase.

April. GROUP 97. *Long.* 21°. *Lat.* 15° N.

25. A penumbral spot near E. limb. Nearly the position of 82.
26. Little change.
27. Nucleus rather angular, a tiny dot n.p.
28. Nucleus quadrangular. The dot is now a small but conspicuous pair.
29. Little change.
30. No outliers seen.

May.

1. Penumbra on the f. side.
2. Decreasing.
3. Still smaller.
4. A mere dot.

April. GROUP 98. *Long.* 357° to 344°. *Lat.* 26° to 30° S.

26. A large spot very near E. limb at 1.24 p.m. A small one to the S.
27. Two compound spots following each other with a few outliers.
28. The p. more normal with two large nuclei, the f. with three and an opening to the N.
29. More widely separated.
30. The p. increasing, the f. decreasing.

May.

1. Nuclei of p. in curves and points, the spot to the S. with three nuclei in a row. The f. with several openings in front and a mass of faculous light in the centre.
2. The p. with two principal nuclei, the f. opening in the opposite direction to yesterday.
3. More normal. Area 2,800 square seconds.
4. The p. much the larger, in shape triangular, one nucleus round and very black, the other branching; a penumbral trail to the S. The f. with two nuclei. Area of both, 2,700 square seconds.
5. Surface decreasing, nuclei of large spot in bars; outliers in little streams. The f. spot with a nucleus detached.
6. Breaking up, penumbra spreading to the N. Outliers circling round in front.
7. Much divided, two principal nuclei, f. spot much smaller.
8. Diminished as well as foreshortened; inclined to form one more regular spot.

April. GROUP 99. *Long.* 324° to 318°. *Lat.* 4° S.

30. A small spot; one f.

May.

1. Surrounded by small spots and dots; a little spot s. f.
2. Nucleus double, two outliers and one dot.
3. Three spots.
4. Diminishing, more outliers.
5. Two spots furthest apart, the p. a little pair.
6. Very small.
7. Still decreasing.

May. GROUP 100. *Long.* 312° to 305°. *Lat.* 10° N.

1. Two tiny groups s. p. 101.
2. A stream of very small spots.

r p. 4830.

May. GROUP 101. *Long.* 296° to 283°. *Lat.* 17° N.

1. A spot near E. limb with penumbra on the f. side, smaller ones to the N.
2. Two principal spots, the larger with several nuclei.
3. The larger lengthening out.
4. No radical change, stragglers in two sets. The p. with as many as seven nuclei and but little penumbra, the f. normal, stragglers in a vertical line to the E. A small spot at some distance s. p.
5. The p. a stream of distinct spots, the f. with penumbra to the W. Two new spots in a line, 8° to 10° p.
6. Stream dwindling.
7. The p. more clustered, the f. one double; a striking number of pairs, including spots in Group 104.
8. More scattered, all slightly decreasing.
10. Many small spots.
12. Near W. limb

May. GROUP 102. *Long.* 49° to 17°. *Lat.* 17° S.

2. A pair of small spots past the centre of disk.

May. GROUP 103. *Long.* 291°. *Lat.* 27° N.

4. A wide pair of small spots.
5. Little change.
6. No increase.
7. Decreasing.

May. GROUP 104. *Long.* 266°. *Lat.* 20° N.

3. A penumbral spot near E. limb.
4. Penumbra on the f. side.
5. Decreasing, a tiny pair n. f.
6. Little change.
7. Two nuclei, penumbra wanting.
8. A small semi-circle of nuclei.

May. GROUP 105. *Long.* 279°. *Lat.* 6° S.

7. An elliptical group of small spots, about 13° E. of central meridian.
8. About 11 in number—a stream.
10. Little change.

May. GROUP 106. *Long.* 316°. *Lat.* 24° N.

10. A small spot preceding Group 101. (Only observed on this date.)

May. GROUP 107. *Long.* 314°. *Lat.* 1° S.

11. A little spot 4° N. of Group 99.

May. GROUP 108. *Long.* 284°. *Lat.* 4° S.

10. A small spot in the Western hemisphere.

May. GROUP 109. *Long.* 197°. *Lat.* 6° N.

10. A spot at some distance from E. limb.
12. No details.
13. Area, 50 square seconds. A small companion to the N.
14. Solitary.
15. Two dots to the N.
16. Very small.

May. GROUP 110. *Long.* 185° to 175°. *Lat.* 11° to 17° S.

10. One or two little spots not far from E. limb.
12. A normal spot; a few smaller f.
13. Great increase. Area 1,040 square seconds.
14. A splendid group; four principal centres of activity; nuclei very irregular, full of bridges and points; abundance of dots and sputterings.

May.

GROUP 110—*continued*.

15. The leading spots enlarged, forming a wonderfully complicated mass, with sharp nuclei surrounding an almost central space filled with faculous matter. The f. altered in position, those to the S. more in a line, those to the N. divergent and more numerous. Length of group 175".
16. Leading spots all much altered in shape and position, central space almost filled up, several conspicuous bridges, the f. more condensed, leaving only dots and penumbral patches between the two principal centres of activity.
18. Nuclei fewer but larger. One of the f. exceeding any of the others, with fissures towards the W. and a small black hole in the f. edge, great masses of penumbra streaming from it.
19. Again more intricate, with dissevered and barred nuclei, a magnificent chaos.
20. Nuclei decreasing, but an immense amount of penumbra encroaching upon the intervening space, almost merging the two centres into one mass.
21. Near W. limb, one of the f. nuclei much elongated.
22. Three of the principal spots almost close to the limb lying N. and S. of each other.

May.

GROUP 111. *Long.* 183°. *Lat.* 19° N.

12. Two small spots at some little distance from E. limb.
13. One very small spot.
14. Several.
15. A leading spot with penumbra towards the W., three nuclear ones f.
16. Leader normal, the f. decreasing.
18. The leader only seen.
19. Decreasing.

May.

GROUP 112. *Long.* 263°. *Lat.* 11° N.

14. A tiny pair very near W. limb, among faculæ.

May.

GROUP 113. *Long.* 154° to 138°. *Lat.* 10° to 15° S.

12. Several spots near E. limb.
13. A train of irregular but distinct spots.
14. Nearly as complicated as Group 110, five centres of activity, the most p. spot in a roughly quadrangular form, one of the nuclei very large, the penumbra on the p. side. Many dots and outliers; a tiny pair p. and another f.
15. Enlarged, the p. altered in position and became still more quadrangular, the large nucleus turning to the S. The f. also increased and having two prominent spots.
16. The p. spots more compact, five large nuclei, two to the S. connected, the f., disposed in curves. Area, 3,700 square seconds.
18. Breaking up. The p. more in the form of a triangle, a great number of dots and sputterings f. Whole group curved; changes constantly taking place.
19. Two nuclei larger than the rest; identification difficult, several spots appear to have split asunder.
20. On the wane, more subdivided.
21. Again more condensed, one separate spot in advance of the rest.
22. No decided change.
24. At 9.15 three spots near W. limb, the foremost having vanished.

May.

GROUP 114. *Long.* 205° to 203°. *Lat.* 14° to 18° S.

14. A nebulous spot not far from the centre of disk.
15. A few very small outliers.
16. Only two; decreasing.
18. Much increased, two penumbral spots, the p. changing rapidly, the f. nearly normal with two nuclei, dots between.
19. Nearly equal. Area, 250 square seconds.

May.

GROUP 115. *Long.* 126°. *Lat.* 15° S.

16. A little cluster, hardly more than dots.
18. Two spots following each other with slight penumbra, a few dots enlarging.

May. GROUP 115—*continued*.

19. Increased, especially the p. which has several nuclei, some scattered outliers.
20. The p. normal, the f. dispersing.
21. The p. half-moon shaped; three widely separated spots f.
22. At 9 a.m. the p. nearly circular, a curved stream of small spots f. Much increased at 6 p.m.
24. P. with two nuclei, the f. spots larger but fewer.
25. Three very small black spots and about six dots among faculæ.
26. One spot.

May. GROUP 116. *Long.* 120°. *Lat.* 11° N.

18. A few very small spots in two sets.
19. More scattered.

May. GROUP 117. *Long.* 106°. *Lat.* 25° N.

18. Two or three little spots (only observed by the Rev. F. J. Eld).

May. GROUP 118. *Long.* 87°. *Lat.* 17° S.

18. A small penumbral spot.
19. Normal.
20. Irregular, small.
21. Three little spots, close together, parallel to the equator.
22. Three spots in a vertical line, widely separated.
24. Two, near each other.
25. One.

May. GROUP 119. *Long.* 67°. *Lat.* 4° S.

18. A large spot and two smaller f. near E. limb.
19. Largest with three nuclei, penumbra on the p. side.
20. Small followers dispersing.
21. Two nuclei; the f. a mass of penumbra joined to the p. by a narrow isthmus.
22. At 9.15 part of the p. dis severed, the f. inclined to the S. At 4.18 the largest nucleus dividing, the penumbra of the f. very transparent.
24. In the form of a horseshoe, the f. fragmentary.
25. In two halves, nuclei tapering; dots in tiny streams f.
26. More in contact.
27. A pair—very little penumbra.
28. Re-united; more penumbra.
29. Very small.

May. GROUP 120. *Long.* 54°. *Lat.* 20° S.

18. A normal spot, near E. limb.
19. A larger one f.
20. Each with two nuclei; two little spots f.
21. The p. split in twain, decreasing, the large spot with more nuclei and showing signs of division; many scattered outliers.
22. Three little spots p., the larger one became a pair; outliers fewer.
24. The pair wider apart with penumbra on one side only. Outliers more numerous but widely dispersed.
25. A perfect pair, nearly circular; outliers altered in position.
26. Further apart; outliers fast vanishing.
27. Still more separated, one with two nuclei.
28. Little change.
29. Decreasing.
30. Very small, no outliers.
31. Faint.

May. GROUP 121. *Long.* 16°. *Lat.* 3° S.

22. A small spot near E. limb.
24. Nearly normal.
25. Penumbra only to the S.
26. Normal, circular.
27. Little change.
28. Little change.
29. Decreasing.

May.

GROUP 121—*continued*.

- 30. Decreasing.
- 31. Little change.

June.

- 1. Little change.

May.

GROUP 122. *Long.* 355°. *Lat.* 12° N.

- 24. A large normal spot about one degree from E. limb.
- 25. Nucleus large and dense. Two small followers.
- 26. Less regular; more outliers, one only with penumbra.
- 27. Nucleus with a large protuberance to the W.
- 28. Signs of division. Major axis more than 1'.
- 29. Nucleus bridged.
- 30. Little change.
- 31. Little change.

June.

- 1. Nucleus nearly entire.
- 2. Nucleus with a black hole in it, and a dazzlingly white bridge N. and S.
- 3. Breaking asunder.
- 4. Detached portion almost gone.

May.

GROUP 123. *Long.* 315°. *Lat.* 15° N.

- 26. A large spot near E. limb at 3 p.m.
- 27. Normal.
- 28. Little change.
- 29. Two-lobed, a tiny trail of dots f.
- 30. Little change; diameter 1' of arc.
- 31. Signs of a bridge.

June.

- 1. Nucleus entire but more angular.
- 2. Black hole in nucleus, f. part bridged vertically, f. trail more pronounced.
- 3. Nucleus jagged.
- 4. Turning a little; black hole still visible.
- 5. A small part of the nucleus detached.
- 6. Very pointed—trail still f.
- 7. At 9.12. The impression of its being a depression irresistible (Pereira); a curved bridge across the nucleus. Trail extending along the f. side.
- 8. Observed by Mr. Wykes as a notch in the limb at 10^h.

May.

GROUP 124. *Long.* 32°. *Lat.* 23° S.

- 27. About four little spots, n. f. 120.
- 28. Two pairs.
- 29. No details.

May.

GROUP 125. *Long.* 320°. *Lat.* 6° S.

- 28. Three little spots in a triangle.
- 29. A little larger.
- 30. In a stream.
- 31. One spot only seen.

June.

- 1. One spot only seen.

May.

GROUP 126. *Long.* 299°. *Lat.* 3° S.

- 29. A very small spot at some distance from E. limb.
- 30. Two, almost circular, with a little penumbra f. each other.
- 31. Little change.

June.

- 1. Little change.
- 2. Irregular, a small pair further N.
- 3. Two spots.
- 4. One, very small, and three faint dots.
- 5. One only.

May. GROUP 127. *Long.* 343°. *Lat.* 0°.

31. Two little spots widely separated, near centre (resembling 126).

June.

1. A stream of dots f.
2. A nearly normal spot—penumbra faint, seven dots f.
3. One spot f.
4. A tiny cluster of dots f.
5. Near W. limb.

May. GROUP 128. *Long.* 271°. *Lat.* 16° N.

30. A very small spot not far from E. limb.

31. Little increase.

June.

1. Three spots.
2. A penumbral spot tapering at the end, a pair p. and a few f.
3. No details.
4. Oblong, nucleus indented, outliers in four sets in a line, far apart.
5. Bridged; nuclei pointed; only three sets.
6. Bridge wider, a little cluster to the N.; one spot and dots f.
7. Three-lobed, cluster increased. None f.
8. Normal, one spot only seen to the N.
9. Irregular.
10. Much reduced, solitary.

June. GROUP 129. *Long.* 299°. *Lat.* 27° S.

2. A very small spot, three dots f.

3. Not seen.

4. Two spots.

5. A little pair.

June. GROUP 130. *Long.* 275° to 267°. *Lat.* 5° S.

2. A very small spot.

3. Rapid increase, two irregular spots.

4. The p. more normal, with curved bridge, dots and sputterings between the two. Area, 650 square seconds.

5. P. with two nuclei, the f. decreasing.

6. P. with a curious rectilinear bridge; a tiny stream f.

7. Normal, penumbra with a point to the N. A cluster of five dots f. and two to the S.

June. GROUP 131. *Long.* 218°. *Lat.* 12° S.

3. A small spot near E. limb.

4. Several.

5. No details.

6. An irregular stream of very small spots and dots.

7. The most f. larger, with penumbra to the E.

8. The f. very compound.

9. Some of the p. increased.

10. P. little altered, the f. more compact.

11. The p. few and small, the f. triple.

12. One spot only p. The f. single, with several nuclei, penumbra on the f. side.

13. Dots only p., the f. still one-sided.

14. Penumbra on both sides.

15. Close to limb at 9.35.

June. GROUP 132. *Long.* 212°. *Lat.* 20° S.

4. A small spot with slight penumbra.

5. Little change.

6. A trifle larger.

7. Nebulous.

8. Little change.

9. A pair.

10. Much the same.

11. Single.

June. GROUP 133. *Long.* 202°. *Lat.* 6° N.? (J.S.T. 5° N.)

4. A small spot and dot near E. limb.
5. A few more.
6. About 12 spots.
7. One dark spot, dots surrounding and f.
8. Much the same.
9. Two pairs, the p. very small.
10. No details.
11. One spot, a very faint stream f.
12. Increased; two penumbral spots.
13. One spot, very compound, with sharp nuclei, and diaphanous penumbra.
14. More normal, major axis 35". Penumbra to the S., with tiny nuclei.
15. Smaller.

June. GROUP 134. *Long.* 190° to 179°. *Lat.* 16° to 20° S.

6. A loose cluster near E. limb. Several medium-sized spots with dots and outliers. (A return of Group 110.)
7. A great amount of faculæ, spots very irregular.
8. One larger than the rest.
9. A train, narrowing at the end, one p. spot normal, the f. interspersed with penumbral patches. A small spot to the N.
10. The f. part, consisting of a large penumbral patch, containing only a few very small nuclei.
11. Train in three sections; two spots leading, the penumbral patch dispersing.
12. Much lengthened out, one leading spot 45" in length, the rest all diminished.
13. Leader normal, the f. in a stream expanding at the end, very misty.
14. The f. fewer. At 4.35 p.m. condensed at the extremity, and forming a bubble-shaped spot.
15. Two spots only conspicuous, the final one-sided, fan-shaped, and vapourous, a few outliers.
16. More scattered spots. N.B.—This group began and ended as a loose cluster, becoming on intermediate days first a train and then a stream.

June. GROUP 135. *Long.* 161° to 156°. *Lat.* 14° to 17° S.

8. A few little spots f., Group 134.
9. About 10, chiefly nuclear.
10. Leading spot much increased, a miniature cluster f.
11. Leader compound, cluster more compact.
12. Leader with two narrow nuclei, penumbra to the S., cluster not seen, a tiny stream of dots f.
13. Leader more normal, circular, the cluster re-appearing in the shape of a spot nearly equal to the leader, a few dots near each. Area, 200 square seconds.
14. Both on the wane.
15. Three small spots.

June. GROUP 136. *Long.* 158° to 153°. *Lat.* 4° to 6° S.

9. Two very small spots near E. limb.
10. The p. gone, the f. larger.
11. A little stream, spots in pairs.
12. In two sections, penumbra slight.
13. More continuous.
14. Leading spot increasing.
15. A great increase, two spots, the p. 45" major axis, more vertical, with several nuclei; the f. about 30", two-lobed, penumbra dark, a few stragglers between.
16. The p. with nuclei sharply divided, one a mere line, the f. diminished.
17. P. normal, nucleus double, f. very small.
18. P. with penumbra wider on the p. side, f. much reduced.
19. Near limb, f. very small.

June. GROUP 137. *Long.* 130° to 118° . *Lat.* 7° to 12° N.

10. A normal spot.
11. Breaking up on the f. side, a small spot to the E.
12. Nucleus triple, dots f.
13. More normal, nucleus pear-shaped, small spots dispersed, dots larger.
14. At 8 a.m. nucleus oval, drawn out and hooked at the end; at 5.45 curved, with a bob at the end.
15. Two spots, nearly circular; in place of the dots a small penumbral spot.
16. The most p. pear-shaped, at 6 p.m. singular narrow fissures at the extremity, the f. on the wane, some small outliers, the penumbral spot became a tiny stream.
17. Both spots increased and almost in contact, with nuclei pointing in opposite directions, more spots f. in a zigzag.
18. Spots all more connected, the final one large, with wedge-shaped nucleus curving slightly upwards.
19. Very complicated, spots looped together with penumbra and many nuclei, forming a massive train, the p. elongated, the final with several nuclei curving downwards, and exhibiting rapid changes.
20. Much foreshortened, spots more separate, nuclei smaller, the p. cup-shaped, showing a red tint at 5.45 p.m. See "Journal," No. 9, p. 387, Vol. IV.
22. Near limb, one large spot at 10.30, a smaller one in advance.

June. GROUP 138. *Long.* 102° . *Lat.* 9° N.

12. A normal spot, with double nucleus near E. limb.
13. Nucleus more divided.
14. Splitting in two.
15. Connected only by a very narrow isthmus.
16. Nuclei more consolidated.
17. A pair, nearly circular. Area 900 square seconds.
18. More widely separated, the f. smaller.
19. The p. normal.
20. P. with two nuclei, the f. almost gone.
21. One spot, nucleus entire.
22. A small outlier.
23. Near limb, solitary.

June. GROUP 139. *Long.* 174° . *Lat.* 19° S.

13. A tiny stream of dots only just visible f., Group 134.
14. Two or three faint spots.
15. In two sets.
16. Mere dots and one small penumbral spot.
17. Great increase, one large spot with smaller ones to the N. of it.
18. Near W. limb, a large spot with two nuclei.

June. GROUP 140. *Long.* 148° . *Lat.* 5° N

13. Three little spots in a line.
14. A few more, in two sets, on the central meridian.
15. A stream.
16. Three, in a line.

June. GROUP 141. *Long.* 81° to 67° . *Lat.* 13° to 16° S.

13. A large spot very near E. limb at 10 a.m.
14. Nucleus divided, outliers to the N. and f.
15. Nucleus with a narrow bridge, f. spots larger.
16. Nucleus two-lobed, f. spots chiefly consisting of penumbra.
17. Elongated equatorially with penumbral appendages, the f. in a zigzag.
18. A magnificent spot, nucleus with two black holes, fimbriated, the f. becoming fragmentary.
19. Nucleus more curved, a bridge observed at 10, black holes still visible, penumbral appendage much drawn out, and uniting with some of the f. spots; area 4,600 square seconds.

June. GROUP 141—*continued*.

20. Nucleus in three divisions, showing a lighter tint to the N.; penumbra still branching at the rear; major axis $1' 15''$.
21. Nucleus in two divisions, difference in tint very slight, penumbra and f. spots somewhat decreasing.
22. Nuclei very large, the p. curved, the f. more quadrangular, a narrow isthmus between penumbra and f. spots also curving.
23. Nuclei more regular.
24. Much foreshortened, a very narrow isthmus between the nuclei on the f. side at 6 p.m.
25. Very bright between the nuclei, no isthmus.
26. Close to W. limb at 10.30 a.m.

June. GROUP 142. *Long.* 174° . *Lat.* 11° N.

16. Two little spots not far from W. limb.
17. One spot in the midst of faculæ.

June. GROUP 143. *Long.* 117° to 113° . *Lat.* 10° to 12° S.

17. A pair of very small spots some distance apart.
18. Much increased.
19. Nearly equal and normal, major axes about $40''$, the f. with two nuclei.
20. Decreasing.
21. The p. much smaller.
22. One spot, nearing W. limb.

June. GROUP 144. *Long.* 110° to 103° . *Lat.* 19° to 22° S.

18. A few small spots in two sets following Group 143, and in many points resembling it.
19. Changing and increasing rapidly, the f. and largest with sharp nuclei curving eastward.
20. Two elongated pretty regular spots, inclining at an angle to each other, with beaded nuclei, length about $40''$.
21. Altered in form and more widely separated.
22. Both double, one of each pair having two nuclei.
23. The p. very near W. limb at 9 a.m.

June. GROUP 145. *Long.* 360° . *Lat.* 12° N.

19. A large spot very near E. limb at 9 a.m., penumbra on the f. side.
20. Normal.
21. A small outlier to the N.
22. Nucleus large.
23. Circular.
24. Nucleus more fimbriated, six outlying dots.
25. A narrow elbow-shaped black hole in nucleus, and a rent in penumbra to the S.
26. Nucleus more oblong, outliers increasing in number.
27. Two more distant outliers.
28. Little change, no outliers seen.
29. One outlier.
30. Nucleus tapering, penumbra nearly equal on both sides.

July.

1. Near W. limb at 5.45 p.m.

June. GROUP 146. *Long.* 349° . *Lat.* 2° S.

20. A small spot near E. limb.
21. Very little penumbra.
22. Increasing.
23. Signs of disruption.
24. Normal, nucleus lighter centrally, as many as 10 outlying minute dots, at 6 p.m. one of them larger.
25. At 8.42 nucleus curled, two hours later divided; no outliers.

Junc. GROUP 146—*continued*.

26. At 7.40 a.m. nucleus curving eastward, at 10.30 in the form of an anchor.
27. Normal, nucleus undivided.
28. Very little change.
29. Much smaller.
30. Very small.

July.

1. Two very faint spots.

June. GROUP 147. *Long.* 317°. *Lat.* 13° to 16° N.

23. A spot near E. limb at 5.12 p.m.
24. Penumbra on the p. side.
25. Nucleus dividing, some fragmentary spots adjacent to the S.
26. Main spot more normal.
27. Nucleus angular.
28. Fragmentary spots s. p.
29. Broken up.
30. Two small spots widely separated.

July.

1. One spot.
2. A tiny black spot; dots in the neighbourhood.
3. Not seen.
4. Near limb, one spot and a great amount of faculæ.

June. GROUP 148. *Long.* 307°. *Lat.* 9° N.

23. A small spot near E. limb.
24. One outlier.
25. Nearly normal; area 200 square seconds.
26. Two outliers.
27. Nucleus dividing.
28. A double spot.
29. Two small spots, quite distinct, a few dots f.
30. A pair, very small.

June. GROUP 149. *Long.* 31°. *Lat.* 9° S.

25. A few very small spots about half of sun's radius from the centre.
26. Rather more, in the form of a trapezium.
27. In the midst of faculæ, hardly visible.

June. GROUP 150. *Long.* 324°. *Lat.* 12° S.

27. Two very small spots, nearly one day E. of centre.
28. At 9 a.m. immense increase, an elliptical cluster of about a dozen spots, the most p. normal, the rest dark with but little penumbra, at 6.25 p.m. more in number.
29. At 8 a.m. in a stream with more penumbra, five of the p. almost in contact, at 6.15 p.m. separating.
30. Three distinct spots, the last double.

July.

1. Again split up into small spots.
2. About six, in a curved stream, many faculæ.

June. GROUP 151. *Long.* 276°. *Lat.* 13° S.

28. A few very small spots at some distance from E. limb.
29. More, in two sets.
30. Two, further apart.

July.

1. Hardly visible.
2. Another pair to the N., inclined in a different direction.

June. GROUP 152. *Long.* 248°. *Lat.* 2° N.

29. A few little spots some distance from E. limb.
30. A wide pair.

July.

1. Rather more in number.
2. A scattered group of some 24 small spots and dots.
3. A wide pair in advance.
4. The most f. larger, those in advance not seen.
5. Again a wide pair; the f. spot decreased.
6. Dwindling.

July. GROUP 153. *Long.* 217°. *Lat.* 7° N.

1. An insignificant spot near E. limb.
2. Irregular, penumbra to the S., one or two smaller spots f.
3. Normal.
4. Nucleus jagged, f. spots in a cluster.
5. Nucleus bridged and elongated.
6. Circular, but nucleus opening centrally.
7. Nucleus trifid.
8. Tapering, penumbra to the N.
9. Nearly circular.
10. Decreasing rapidly.

July. GROUP 154. *Long.* 237° to 228°. *Lat.* 16° to 19° N.

2. A pair of small spots, about two days from E. limb.
3. A stream.
4. Almost a zigzag, the first and last spot much larger; area 260 square seconds.
5. In two sets, inclining in different directions, the first a stream of sharp nuclei, the second with two penumbral spots.
6. The first reduced, consisting of two pairs only, the second still more.
7. A circular spot p., with penumbra to the S. and triple nucleus, three small single spots f. some distance apart.
8. One spot, decreasing rapidly.

July. GROUP 155. *Long.* 191°. *Lat.* 14° S.

2. A small spot near E. limb.
3. Little change.
4. Penumbra on the p. side.
5. A small spot f.
6. Single.
7. A wide pair.
8. Decreasing.
9. A close pair.
10. Two little spots, N. and S. of each other.
11. Very faint.

July. GROUP 156. *Long.* 189° to 180°. *Lat.* 10° to 12° N.

2. A considerable spot close to E. limb at 9 a.m.
3. A small one f.
4. Normal, more spots f.
5. Two of the f. with penumbra.
6. Great increase; a train, leading spot the largest, in length 40''; four with penumbra following besides outliers.
7. Leader with nucleus tapering, the f. more connected but inclined to disintegration and formation of miniature streams.
8. Many minor changes, the leader vertical.
9. Leader with nucleus curving eastward, two penumbral spots f.
10. Leader crescented, penumbra on the p. side, the most f. curved with penumbra in the opposite direction.

July.

GROUP 156—*continued*.

11. Last spot and leader nearly equal, intermediates fast decreasing; some hours later leader more broken up, with a tiny stream of dots issuing from it at the rear.
12. Nucleus of leader trifold, two dots only left of the stream, last spot nearly normal, with dots p.
13. A pair; diminishing, dots almost gone.
14. Leader the larger of the two, with double nucleus, near limb.

July.

GROUP 157. *Long.* 178° to 167° . *Lat.* 17° to 20° S.

3. A penumbral spot near E. limb, a smaller one f.
4. Nucleus divided, two spots f. (The same position as the f. part of 134.)
5. Nucleus wavy, a portion to the N. almost severed, one of the f. spots almost normal, a new one to the S.
6. Severed portion reduced to a pair of small nuclei, penumbra, almost confined to the f. side, the most f. spot now the largest, breaking up to the N., with a patch of penumbra as if thrown off, a few small outliers only besides.
7. The p. with one of the small nuclei more distant, the f. as large again, upper portion still disrupted with more small nuclei.
8. The p. still one-sided, a new spot at some distance n. p., the f. normal, more than $1'$ in length, nucleus tapering; 10 hours later, bridged in several places and egg-shaped.
9. P. very much reduced, now a close pair, the f. more circular.
10. The pair p. very small, the f. spot vertical, pointed at one end.
11. Signs of disruption in the f., small nuclei bursting forth.
12. The pair gone, the f. more curved and elongated.
13. Broken up at the extremity.
14. More normal, penumbra with a pointed projection to the S.

July

GROUP 158. *Long.* 279° . *Lat.* 12° S.

6. A pair of small dark spots at some distance from W. limb. Probably identical with 151.

July.

GROUP 159. *Long.* 206° to 199° . *Lat.* 14° to 18° S.

6. A few tiny spots preceding Group 155.
7. In three sets and more in number, the p. spot compound, the rest very diminutive.
8. The p. more circular, nucleus trifold, more dots interposed, forming a little irregular stream.
9. Three principal spots.
10. The p. nearly normal, only one spot f.
11. Little change.
12. Decreasing.

July.

GROUP 160. *Long.* 136° . *Lat.* 8° to 13° N.

6. A large spot very near E. limb at 7.45 a.m., a penumbral patch above and a faint spot p.
7. Large spot with two nuclei, the penumbral patch with one, outliers between.
8. The two spots more widely separated with penumbra on opposite sides.
9. The N. spot with more scattered nuclei.
10. The spot to the S. with three nuclei, one very large and dense, a new spot at some distance to the N.
11. The N. spot completely shattered and become a mass of small nuclei, the southerly one fan-shaped, nuclei split up and decreased, radiations from the centre distinct.
12. Penumbra of S. spot closing round the nuclei in a circle, leaving an opening only to the N., a decided change taking place between 9.30 and 10.50, nuclei small and sharp, one only united to the main spot by a dark narrow line, the shattered fragments more dispersed.

July.

GROUP 160—*continued*.

13. Penumbra entirely closed up all round, nuclei still more subdivided and intricate, radiating also from the main spot northwards, with dots encircling the whole on three sides, a very faint stream of them also f.
14. Main spot quite circular, 50'' in diameter; 8° N. lat. the nuclear radiations of yesterday increased and containing more penumbra and many tiny nuclei placed in rows. At 6 p.m. penumbra again splitting to the N., the stream of dots not seen.
15. A great change, main spot with one large elongated nucleus, the rest comparatively few and almost united to it.
17. Small nuclei still decreasing.
18. Near limb, much extended to the N. and S., four principal nuclei.

July.

GROUP 161. *Long.* 125°. *Lat.* 10° N.

7. A small penumbral spot f. Group 160. (Position of 137.)
8. Normal, one outlier.
9. Pointed at the extremity.
10. Little change.
11. Dividing to the N., major axis 40'', dots to the S.
12. Nucleus more angular.
13. Nucleus forked and opening to the S.; dots in a tiny stream.
14. Nearly normal, three small outliers.
16. Decreasing, more circular.
17. Little change.
18. Penumbra only to the N.
19. Still smaller.

July.

GROUP 162. *Long.* 110°. *Lat.* 10° N.

11. A very small spot f. 161.
12. No change.

July.

GROUP 163. *Long.* 139°. *Lat.* 10° S.

11. A small pair of spots, widely separated, at 8 a.m. Seven hours later more in number, dark, but without penumbra.
12. Further increase, the most p. nearly circular, with a curious crooked nucleus, diameter 30''. The f. spots in a sickle-shaped curve consisting of small nuclei, with slight penumbra.
13. Still increasing. Two penumbral spots, the p. more normal, tapering, the f. wedge shaped, many dots and tiny nuclei scattered between the two.
14. The p. with a portion as it were sliced off, the f. become two spots, the f. more scattered and altered in position, two spots with penumbra.
16. The p. normal, the f. all fragmentary.
17. One spot near limb.

July.

GROUP 164. *Long.* 103°. *Lat.* 19° S.

11. At 8 a.m. a pair of small spots, increasing at 3 p.m.
12. In a triangle, with a little penumbra.
13. About six in number without penumbra.
14. A few very faint dots.

July.

GROUP 165. *Long.* 89°. *Lat.* 11° S.

10. A penumbral spot not far from E limb.
11. Normal.
12. A small spot p.
13. Elongated and inclined to the equator, major axis 30''.
14. Split into three or four little spots, close together, with penumbra to the N.
16. One very faint spot.

July. GROUP 166. *Long.* 78°. *Lat.* 9° to 14° S.

10. Two penumbral spots N. and S. of each other, very near E. limb at 6.20 p.m. Position of 141.
11. A. (the N. spot) normal, B. (the S. spot) double, a few smaller ones f.
12. The two spots nearly equal. A. with a small portion dissevered. B. with two nuclei, one very large, three penumbral spots f.
13. Each spot with two nuclei, one larger than the other, the f. spots decreasing.
14. A. with a huge dense nucleus, bridged at the extremity, diameter 55". B. now the larger, diameter 1', bridged in two places, two small penumbral spots f.
16. A striking pair, both spots tapering and pointing S., with two nuclei, one large and the other very small, a cloud of outliers f.
17. Nuclei of A. and B. nearly at right angles to each other.
18. A. with the pointed end of nucleus curving round westward. B. more pointed at the extremity, and a tail like appendage of dots and fragments.
19. Nucleus of A. curved in the form of a horse-shoe and turned southwards. B. more normal but pointed at both ends, outliers f. in a stream.
20. Again nearly equal. A. more angular, outliers few.
21. A. with nucleus entire. B. blunted at the extremities.
22. Both spots nearly normal.

July. GROUP 167. *Long.* 66°. *Lat.* 12° S.

12. Two penumbral spots, following Group 166, N. and S. of each other.
13. The spot to the S. about 20" major axis, the one to the N. not seen, but two very small spots p.
14. Much reduced, a miniature cluster of dots p.
16. Dots surrounding.
17. Little change.
18. Elongated, some small outliers p. and f.
19. A wide pair, a tiny cluster of dots f.
20. A stream almost entirely composed of dots.
21. Three dots widely separated and a few nearer Group 166.

July. GROUP 168. *Long.* 55°. *Lat.* 8° N.

12. A spot very near E. limb at 9.30 a.m.
13. Nearly normal.
14. Penumbra wider on the p. side.
16. Great increase, a pear-shaped spot with penumbra only on the p. side; to the S. four nuclei linked together with penumbra, dots and small spots in a semi-circle n. f. A wide pair n. f. at some distance.
17. Outliers to the N. increasing, those to the S. altered in position.
18. A large spot, nucleus forked at the end, some of the spots to the S. confluent with more penumbra; a half-moon shaped spot to the N.
19. Major axis 45", nucleus enlarged, turning eastward, spots to the S. dwindling and compressed, the half-moon shaped spot dispersed and become a stream of fragments.
20. Outline regular, nucleus in three divisions, the middle one crescented, outliers much diminished.
21. Much broken up with many sharp nuclei.
22. A portion of the N. side severed.
23. Normal; no outliers observed.

July. GROUP 169. *Long.* 58° to 46°. *Lat.* 10° to 12° S.

13. Two spots near E. limb resembling Group 167. Many faculæ to the S.
14. The p. with two nuclei, broken up on the f. side, major axis more than 30".
16. The p. decreased, the f. now the larger, with pointed nucleus, dots and sputterings in the neighbourhood; three small spots at a distance s.f.
17. The f. spot decreasing, some outliers larger.

July. GROUP 169.—*continued.*

18. Many spots forming a wide stream, two of the p. only with penumbra, distant spots in a line.
19. Stream no longer double but curved round to the S. More penumbral spots interspersed with nuclei and dots.
20. Apparently two larger spots in course of formation, the rest fewer in number.
21. On the wane, spots more equal in area, with sharp nuclei.
22. Many little spots in a serpentine stream.

July. GROUP 169A. *Long.* 25°. *Lat.* 30° S.

16. Two spots very near E. limb at 5 p.m.
17. A pair, nearly normal.

July. GROUP 170. *Long.* 357°. *Lat.* 13° N.

16. Two spots very near E. limb at 5 p.m. (Position of Group 145.)
17. A pair, nearly normal.
18. The p. with two nuclei.
19. Both normal, a few outliers. (N.B.—Three large double spots now visible at the same time.)
20. Nuclei inclined in different directions. Length, 40'' and 45''.
21. Nuclei elongating and bridges appearing in both, outliers few and small.
22. A small spot in advance.
23. The p. circular.
25. The p. smaller with curved nucleus, the f. with forked nucleus.
26. The p. with penumbra only on the W. side, the f. normal, a few outliers to the N.
27. The p. half the size of the f., with penumbra still westward.
28. The p. very much reduced.
29. The f. close to W. limb at 12.30.

July. GROUP 171. *Long.* 345°. *Lat.* 14° N.

18. Two large spots near E. limb, having nearly the same longitude.
19. A pair, major axis of each about 30''.
20. Nuclei inclined in different directions (as in Group 170).
21. Nuclei in the same direction and closer together, one larger.
22. Almost in contact, a few followers.
23. Contiguous. Area, 1,500 square seconds.
25. Two portions almost severed, with narrow nuclei and penumbra on one side.
26. Again two spots with the same longitude.
27. The N. spot decreasing.
28. Three spots, much reduced, with little penumbra.
29. Near W. limb, one spot only conspicuous.
30. Close to W. limb.

July. GROUP 172. *Long.* 328°. *Lat.* 9° S.

20. A few small spots not far from E. limb.
21. An elliptical group, the leading spot the largest with two curved nuclei.
22. Leader increasing, the f. more in a stream.
23. The f. spots coalescing; area, 1,000 square seconds.
24. Leader with irregular elongated nucleus, the f. faint and small.
26. More circular, the f. few and widely separated.
27. Nucleus divided.
28. Undivided, more quadrangular.
29. Normal.
30. Penumbra rather wider on the p. side and also fainter.
31. Very near W. limb at 9 a.m. Penumbra decidedly wider p.

July. GROUP 173. *Long.* 301°. *Lat.* 16° N.

21. A medium size spot with the nucleus in the form of a magnet.
22. Little change.
23. Normal.
25. Nucleus jagged, with a black hole in it.
26. Black hole still conspicuous, penumbra forked to the S. Area, 1,212 square seconds.
27. Normal, small nuclei to the S.
28. Circular, three little spots s.p.
29. Much fimbriated, black hole across the centre of nucleus.
30. Nucleus with a process on the f. side, outliers few and very small.
31. Penumbra nearly equal on both sides.

Aug.

1. A little wider on the p. side.
2. Decidedly wider.

July. GROUP 173A. *Long.* 272°. *Lat.* 13° N.

25. A scattered group of very small spots s.f. 173.

July. GROUP 174. *Long.* 281°. *Lat.* 21° S.

23. A normal spot near E. limb.
25. Nucleus sharply fissured to the N., a few small spots f.
26. Nucleus jagged on the W. side.
27. Little change.
28. Nucleus tapering.
29. More angular. Area, 600 square seconds.
30. Signs of breaking up.
31. Nearly normal.

Aug.

1. Little change.
2. Penumbra rather wider nearest the limb.
3. Little change.

July. GROUP 175. *Long.* 222°. *Lat.* 11° S.

29. Two pairs of tiny spots.
30. A few more, further apart.
31. Very small.

Aug.

1. Not seen.
2. Two dark nebulous spots, a smaller one p.

July. GROUP 176. *Long.* 193° to 178°. *Lat.* 6° to 13° N.

29. Two spots near E. limb. Faculae observed on the 28th. Position of the f. spot of Group 156.
30. A train; two compound spots, the leader with nucleus in a quartrefoil and many outliers.
31. All the spots much disintegrated with small sharp nuclei.

Aug.

1. Leader decreasing, much divided, penumbra only to the S., the f. almost split in twain, with two nuclei in each portion.
2. Leader became two small spots. The f. large and very complicated, with a gap in the middle and many irregular nuclei, the largest showing a difference in tint. A multitude of small spots and dots between, and a few more widely scattered p.
3. Large spot nearly vertical with three principal nuclei, one of them more to the E. than on the 2nd. Mr. Hale White mentions it as abounding in delicacy of detail, impossible to describe, one marking being almost like a hair line, outlying spots altering in form and position.
4. More elongated with a loop to the S. Nuclei decreasing in area and again altered in position, two to the N. nearly equal and parallel, small ones depending below like strings of beads, outliers fewer and much dispersed.

Aug. GROUP 176—*continued*.

5. Slowly decreasing and breaking up, the nuclei still changing, outliers more numerous and also altered in position; a new stream to the N.
6. Further change and disintegration in the main spot, now more inclined to the equator and with less penumbra, some of the outliers larger, a long stream of dots in a curve s.f. Area, 1,000 square seconds.
7. Main spot more fragmentary on the p. side, a small one to the S. of it vastly increased, with sharp nuclei in a zigzag, a little stream f., distant outliers nearly gone. Area, 1,200 square seconds.
8. Three distinct spots still showing rapid changes. At 4.45 p.m. nuclei much developed.
9. Two principal groupments and two principal spots, one to the S. nearly normal, outliers fewer but larger.
10. Still very compound, outliers decreasing in area.
11. Near W. limb, two conspicuous spots.

July. GROUP 177. *Long.* 175°. *Lat.* 5° N.

30. A pair of small spots f. Group 176, forming part of the same train.
31. The p. double, the f. nuclear, some outliers.

- Aug.
1. Two pairs, one spot normal, the others with slight penumbra, no outliers.
 2. The p. pair much reduced.
 3. The p. gone, the f. broken up into small spots.
 4. Two spots, one with penumbrae.

Aug. GROUP 178. *Long.* 145°. *Lat.* 18° N.

2. A spot near E. limb, penumbra on the p. side.
3. Penumbra equal on both sides, one or two small spots and bright faculae f.
4. Normal, two f. spots.
5. Nucleus tapering, a small portion severed, the f. spots gone.
6. Nucleus bursting out and discharging fragments at the rear. Area, 900 square seconds.
7. Fragments dispersing.
8. Oval, one fragment only left.
9. Normal, nearly circular.
10. Little change.
11. Little change.
12. Little change.
13. Nearing W. limb.

Aug. GROUP 179. *Long.* 142°. *Lat.* 6° N.

2. A small penumbral spot near E. limb.
3. Little change.
4. A few outliers.
5. Decreasing.
6. Two very small spots.

Aug. GROUP 180. *Long.* 146° to 140°. *Lat.* 15° to 13° S.

2. A few little spots, widely separated.
3. No increase in area.
4. One spot.
5. Nearly normal.
6. Breaking up; two dots at some distance to the N.
7. No increase; dots larger.
8. At 9.30. Many small spots and dots p. in an ellipse, a few f. in a triangle. At 4.45 p.m. some of the p. spots larger, more nuclear, and very dark.
9. At 7.45 a.m. a normal spot p., major axis 45'' of arc, a singular compound spot f. with an excess of penumbra. A few outliers.
10. The p. tapering, the f. nearly normal with two nuclei, more outliers.
11. The f. with one nucleus.
12. Each with two nuclei.
13. The f. with three nuclei; a new spot f.
14. Two spots near W. limb, at 9.45 a.m. a bright patch of faculae f.

Aug. GROUP 181. *Long.* 163°. *Lat.* 19° S.

1. A small normal spot near E. limb.
2. Two more further S.
3. More outliers p., the spots to the S. gone.
4. Decreasing.
5. Three quite small spots in a triangle.
6. Little change.
7. One spot increased, four dots p. and one f.
8. At 5 p.m. Two tiny pairs in a line. (On the 9th only faculae.)

Aug. GROUP 182. *Long.* 85°. *Lat.* 12° S.

7. A spot near E. limb, penumbra wider on the p. side.
8. Penumbra rather wider on the f. side. (Nearly the position of 165.)
9. Normal.
10. Little change.
11. Little change.
12. Nucleus double.
13. Nucleus single.
14. Nearly circular.
15. Little change.
16. Decreasing.
17. Penumbra about equal on both sides.
18. Much reduced.

Aug. GROUP 183. *Long.* 71°. *Lat.* 16° S.

7. A spot with slight penumbra, very near E. limb at noon.
8. Little change.
9. Major axis 35'', penumbra a little wider on the f. side.
10. Little change.
11. Very similar to 182.
12. Circular.
13. Somewhat decreasing.
14. Nucleus more angular.
15. Major axis about 20''.
16. Little change.
17. Decreasing.
18. Penumbra a little wider on the p. side.
19. Near limb.

Aug. GROUP 184. *Long.* 80°. *Lat.* 21° S.

7. A very small spot near E. limb.
8. Several.
9. Two; widely separated.
10. A tiny pair n. f.
11. No increase.
12. One spot.

Aug. GROUP 185. *Long.* 15°. *Lat.* 28° S.

15. A pair of very small spots.
16. Another tiny pair f.

Aug. GROUP 186. *Long.* 31° to 20°. *Lat.* 2° to 8° N.

11. Two considerable spots near E. limb.
12. Three compound spots. Area 2,000 square seconds.
13. The three principal spots nearly at right angles to each other, nuclei angular.
14. General outline, as well as component parts, altered; spots confluent, nuclei increasing and curving in opposite directions. Strong reversal of the C line over the larger nuclei.
15. At 10.30 spots still more confluent, showing a vast extent of surface covered with a mass of nuclei and penumbra partially connected and very variable in form. At 1 p.m. the largest nucleus to the S. heliocal, throwing out feelers like a jelly fish. Group inclined to the equator. Area 8,000 square seconds.

Aug. GROUP 186--*continued*.

16. At 10.50 more disintegrated, two nuclei larger than the rest, the p. with a branch of dazzling white matter and a double stream of small nuclei stretching out to the W. At 3.30 further disintegration; group nearly reaching the central meridian.
17. At 6 p.m. Becoming elongated, spots more in a train, wavy, the large nucleus p. quadrangular, one of the f. pear-shaped and showing a difference in tint, spots at the rear branching.
18. More divided and extended in latitude, three huge spots, the two p. both with a difference of tint in the nuclei, the rest more numerous, still forming a confused fragmentary mass. Area 6,200.
19. Difference in tint still discernible in the large nuclei, smaller constituents decreasing. (Only one observation by Prof. Pereira.)
20. The two large p. spots just in contact and more normal, the rest fast diminishing, their components being more penumbral than nuclear. Area 3,000 square seconds.
21. The two p. spots distinctly separated, the f. still more on the wane.
22. Spots smaller and still more separated, three principal ones.

Aug. GROUP 187. *Long.* 347°. *Lat.* 20° S.

15. A small penumbral spot some distance from E. limb, but not observed on the 14th.
16. Nucleus double.
17. Little change.
18. Penumbra chiefly to the N., a tiny stream of dots closely p. Area, 50 square seconds.
19. Decreasing.
20. Penumbra slight.
21. Little change.
22. Very small and faint.

Aug. GROUP 188. *Long.* 336°. *Lat.* 7° S.

15. A penumbral spot.
16. Penumbra nearly equal on both sides.
17. Normal.
18. Little change.
19. Area, 200 square seconds.
20. Nucleus pear-shaped.
21. No details.
22. Nucleus dividing.
23. Fast decreasing.

Aug. GROUP 189. *Long.* 323°. *Lat.* 26° S.

16. A little pair near E. limb imbedded in faculæ.
17. Hardly any increase, two dots f.
18. Smaller, faculæ still surrounding.

Aug. GROUP 190. *Long.* 298°. *Lat.* 18° N.

17. A penumbral spot; near E. limb at 6 p.m.
18. Penumbra wider on the f. side. A small nucleus detached from the larger one.
19. Small nucleus outside the penumbra.
20. Penumbra wider on the p. side.
21. Little change.
22. Normal.
23. Decreasing.
24. Still smaller.

Aug. GROUP 191. *Long.* 302°. *Lat.* 13° S.

17. A small spot with slight penumbra near E. limb.
18. Nucleus dividing.
19. Area, 20 square seconds. Conspicuous faculæ f.
20. Little change.
21. A pair.
22. Single.

Aug. GROUP 192. *Long.* 352° to 348°. *Lat.* 6° to 8° N.

20. Three very small spots, the first a pair.
21. The first with a little penumbra.
22. Another very small spot f.

Aug. GROUP 192A. *Long* 20°. *Lat.* 17° S.

21. A small spot at some distance from W. limb.

Aug. GROUP 193. *Long.* 317°. *Lat.* 15° N.

26. A tiny spot and one dot.
27. Two pairs and a few dots, one with slight penumbra.
28. Three spots near W. limb, two of them rather larger.

Aug. GROUP 194. *Long.* 216°. *Lat.* 6° S.

26. A few small penumbral spots in two sets at some distance from E. limb.
27. The leading spot much enlarged with three nuclei, the rest forming a stream.
28. Leader nearly normal, nucleus still divided, three f. spots. Area, 400 square seconds.
29. Many small nuclei in leader, f. spots forming a triangle.
30. Decreasing, only one f. spot.
31. Still on the wane.

Sept.

1. Solitary.
2. Double.
4. Near limb.

Aug., GROUP 195. *Long.* 180° to 174°. *Lat.* 8° to 14° N.

26. A penumbral spot near E. limb preceded by an immense range of faculæ (a return of Group 176).
27. Nucleus two-lobed.
28. Splitting in twain, a few small followers.
29. Entire, the f. increased, forming a triangle with the leader. This also occurred in Group 194 on the same date.
30. More circular, nucleus angular, the f. more numerous but smaller except the final which has increased and become double. At 5.40 p.m. two of the f. spots much larger, also the final.
31. Three principal spots well developed. The final very compound.

Sept.

1. The two leading spots more in a line and becoming normal, the final changing, a penumbral spot to the N. of it, more small outliers.
2. Leaders decreasing but a rapid growth in one of the outliers. The final normal with curved nucleus.
4. Leaders unrecognisable, only three small spots, two of them close pairs, p. The final more abnormal and shorn of nearly all its attendants.
5. One small spot p., the final dwindling and almost alone.
6. The p. gone, the final more reduced.
7. One spot, nearing W. limb.

Aug. GROUP 196. *Long.* 141°. *Lat.* 10° S.

30. A faint spot in the midst of faculæ—a great amount also s. p.
31. Two or three, very small.

Sept. GROUP 197. *Long.* 110° to 103°. *Lat.* 14° to 17° S.

2. Two very faint spots surrounded by faculæ.
4. Both increased especially the most northerly, dots f.
5. The northerly with penumbra and several small nuclei, the southerly only a tiny stream.
6. The northerly dispersing.
7. Three faint little spots, nearly equidistant and a pair.
8. Two spots, very faint.
9. One spot.
10. A close pair.

Sept. GROUP 198. *Long.* 84° . *Lat.* 30° N.

4. A small spot at some distance from E. limb.
5. Two.
6. Very faint.
7. Little change.
8. Two pairs very widely separated.

Sept. GROUP 199. *Long.* 57° . *Lat.* 8° S.

5. A penumbral spot near E. limb.
6. Penumbra wider to the N.
7. Chiefly confined to the S.
8. More normal, penumbra on the p. side.
9. Elongated and tapering.
10. Broken up at the extremity.
11. Fragmentary.
12. A few little spots in a semi-ellipse, dots f.
13. A miniature stream.

Sept. GROUP 200. *Long.* 142° . *Lat.* 11° S.

6. A scattered cluster of small spots, same position as 196, 24° W. of centre.

Sept. GROUP 201. *Long.* 42° . *Lat.* 17° N.

6. A normal spot near E. limb. Penumbra rather wider on the p. side.
7. Nucleus two-lobed.
8. Pear shaped.
9. Little change.
10. Nucleus oblong, fimbriated, penumbra radiating from it, major axis more than $1'$ of arc. A few small followers.
11. Nucleus more circular.
12. Radiations in penumbra still visible.
13. Rather more angular; no outliers.
14. Little change.
15. Pear shaped.
16. Nucleus nearly triangular.
17. Little difference perceptible in the width of penumbra.
18. Very near E. limb at 6.24 p.m. (Azores.)

Sept. GROUP 201A. *Long.* 56° to 52° . *Lat.* 18° to 20° N.

8. A few small spots n. p., Group 201.
9. Rather increased.
10. Two little compact clusters of nuclei.
11. The p. dispersed, chiefly dots, the f. more condensed.
12. The f. only left, decreasing.
13. Smaller.
14. Still smaller.
15. Hardly visible.

Sept. GROUP 202. *Long.* 48° to 36° . *Lat.* 14° to 17° .

6. Two penumbral spots near E. limb following each other.
7. More compound.
8. Enormous increase, a large triangular group consisting of many irregular spots with small nuclei, the first and last the largest.
9. A stream expanding in the middle, spots more in number but decreasing in area, a few detached to the N.
10. Still more numerous, many small sharp nuclei without penumbra, three of the following larger than the rest; none to the N.
11. Less stream-like with two principal centres of activity, the final spot normal.
12. Details much altered, in outline a zigzag, almost entirely composed of small nuclei, the final spot also broken up and merged into some of the p., with irregular wing-shaped penumbral patches. Nearly central.

Sept.

GROUP 202—*continued*.

13. A more complete zigzag, with little streams radiating from it; further change near the extremity. Length 4' of arc.
14. Nuclei more dispersed, general character retained.
15. Much attenuated in front. A larger spot to the rear.
16. Compounds still small, but more evenly distributed.
17. Much foreshortened.
18. Only the most f. spot visible; faculæ numerous.

Sept.

GROUP 203. *Long.* 35°. *Lat.* 9° N.

6. A penumbral spot very near E. limb at 8 a.m., in nearly the same position as Group 186 (rather more in advance).
7. Normal.
8. Nucleus irregular.
9. Penumbra nearly equal on both sides.
10. Nucleus with four divisions; major axis nearly 45".
11. Breaking up and decreasing.
12. Much reduced.
13. One or two outliers.
14. Still decreasing.

Sept.

GROUP 204. *Long.* 39°. *Lat.* 6° N.

7. A small spot s. p., Group 203.
8. Nucleus double; major axis about 15".
9. Decreasing.
10. Penumbra chiefly confined to the S.
11. Very small.

Sept.

GROUP 205. *Long.* 26°. *Lat.* 20° N.

7. An indistinct spot near E. limb.
8. Little change.
9. Decreasing.
10. Little change.

Sept.

GROUP 206. *Long.* 156°. *Lat.* 11° N.

8. A few little spots at some distance from E. limb.
9. One spot, rather larger.

Sept.

GROUP 207. *Long.* 16°. *Lat.* 12° S.

8. A small spot near E. limb.
9. Little change.
10. Little change.
11. Decreasing.
12. Nebulous.
13. Very small.

Sept.

GROUP 208. *Long.* 108° to 105°. *Lat.* 4° S.

9. Three small faint spots.
10. Two, more widely separated.
11. One spot.

Sept.

GROUP 209. *Long.* 328°. *Lat.* 11° S.

11. Two very small spots in the midst of faculæ.
12. One faint spot.
13. A little larger.
14. A cluster of small nuclear spots and dots.
15. Two incipient spots, widely separated. Area, 36 square seconds.
16. Record imperfect.
17. Decreasing; area, 18 square seconds.

Sept.

GROUP 210. *Long.* 79°. *Lat.* 11° S.

13. A small hazy spot at some distance from E. limb. Position of 182.
14. A little pair, with one following at some distance.

Sept. GROUP 211. *Long.* 316° to 309° . *Lat.* 7° to 9° S.

13. A penumbral spot near E. limb (A).
14. Penumbra rather wider on the f. side.
15. Penumbra confined to the p. side; a nebulous spot following at some distance (B.).
16. No record.
17. A. preceded by some smaller spots, B. normal.
18. Nucleus of A. broken up; three spots in a row n. p., with slight penumbra. B. circular.
19. A. splitting into fragments, one of the n.p. spots nearly normal, with a double nucleus, apparently two united.
20. B. in two parts, the n. p. with dots streaming from the extremity, major axis $30''$. The remains of A. in two sections.
21. The n. p. spot with a portion detached; B. circular, solitary.
22. Two spots nearly similar in area.
23. Both nearly normal.
24. Faculæ numerous.
25. B. near W. limb.

Sept. GROUP 212. *Long.* 345° . *Lat.* 7° S.

15. A little stream.
16. Not seen.
17. About two spots.

Sept. GROUP 213. *Long.* 234° . *Lat.* 19° N.

19. A normal spot near E. limb; a small one following at some distance.
20. Nucleus divided; major axis about $30''$.
21. A small portion of the nucleus detached at either end.
22. Normal.
23. Little change.
24. Breaking up at the f. end.
25. A portion detached.
26. Much decreased.
27. Very small.
28. Faint.
29. Little change.

Sept. GROUP 213A. *Long.* 205° . *Lat.* 17° S.

21. A wide pair of small spots.
22. One spot.
23. A pair; area, 20 square seconds.
24. More widely separated.
25. One very small spot.

Sept. GROUP 214. *Long.* 218° . *Lat.* 4° N.

23. Two small spots at some distance from E. limb.
24. Three spots.
25. A cluster.
26. Two spots.

Sept. GROUP 215. *Long.* 121° . *Lat.* 10° N.

27. A normal spot near E. limb, penumbra wider on the p. side.
28. Penumbra nearly equal on both sides.
29. Rather wider on the f. side, a small spot p.
30. Nucleus becoming irregular.

Oct.

1. Major axis about $35''$.
2. Circular.
3. No change.
4. The same.
5. The same.
6. Still normal.
7. Penumbra nearly equal on both sides; a light patch in the centre, and signs of disruption.
9. Near W. limb.

Sept. GROUP 216. *Long.* 227° to 218°. *Lat.* 11° S.

28. A new outburst, two spots apparently in course of formation, differing in long. 7°. A reversal and distortion of the -C. line, observed by Mr. Townsend over the most p.
29. The p. enlarged and almost normal, the f. also more condensed but much smaller.
30. The p. normal, the penumbra slightly wider on the f. side, the f. fast decreasing.

Oct.

1. Near W. limb.

Sept. GROUP 217. *Long.* 97°. *Lat.* 14° S.

29. Some irregular spots near E. limb.
 30. Smothered in faculæ; increasing.
- Oct.
1. A train; many dots and small nuclei, penumbra slight.
 2. Increased, the two most f. spots forming a singular pair.
 3. Spots in two sets, the pair dispersed.
 4. Much decreased.
 5. Two small spots.

Sept. GROUP 217A. *Long.* 102°. *Lat.* 10° S.

30. A small penumbral spot following Group 217.

Oct.

1. Penumbra to the S. only.
2. Nucleus curved and dividing.
3. Penumbra on the s.f. side.
4. A sparse cluster of very small spots.
5. Spots in two sets, the upper prolonged equatorially.
7. Two small spots, widely separated.
8. One faint spot.

Sept. GROUP 218. *Long.* 179° to 175°. *Lat.* 8° to 10° N.

30. A cluster of small spots, past the centre of disk (new).

Oct.

1. Hardly more than one spot. Seen by Prof. Pereira on 3rd and 4th.

Oct. GROUP 219. *Long.* 67° to 50°. *Lat.* 8° to 15° S.

1. A spot close to E. limb at noon.
2. A train.
3. Three large spots closely following each other, nuclei much subdivided, penumbra irregular.
4. A wonderful aggregation of nuclei and penumbra intermixed, some of the nuclei with well-defined bridges.
5. Nuclei increased in area, some of the larger in curves.
7. Three principal centres of activity, forms all changing, more small nuclei in streams mixed with dots.
8. Nearly central, leading spot more normal, forked at the extremity, several large nuclei f. but still very compound.
9. Some spots larger, some smaller, but no very radical change.
10. Leader with dense oblong nucleus, the other large nuclei more subdivided.
11. More little streams.
12. The smaller constituents fast disappearing, also the spots in the middle, the first and last only of much importance, the last with six or seven nuclei.
13. Much foreshortened. Penumbra nearly equal to the E. and W. of leading spot.
14. Leader vanished, last spot near but not close to limb at 12 noon.

Oct. GROUP 220. *Long.* 56°. *Lat.* 13° N.

2. A penumbral spot near E. limb.
3. Nucleus irregular, a vacant space centrally.
4. More normal.
5. Little change.
7. Nucleus bridged in two places, major axis 45".
8. Nucleus pointed and tail-like at the f. end.
9. More broken up.
10. Little change.
12. More circular.
13. Penumbra nearly equal on both sides.
14. Wider on the p. side.

Oct. GROUP 221. *Long.* 40°. *Lat.* 19° N.

3. A penumbral spot f. 220, nearly same position as 201. A pair of dots between the two.
4. Nucleus double, the p. dots increased, forming a small cluster.
5. Normal, nucleus entire.
7. Circular, major axis 40". The p. cluster reduced to one spot.
8. Nucleus pointed at the f. end. This was the case with 220 on the same date.
9. Nucleus breaking up.
10. Nucleus jagged.
12. Crescented.
13. Little change.
14. Penumbra nearly equal on both sides.
15. Near W. limb, smaller than when equally distant from E. limb.

Oct. GROUP 222. *Long.* 25° to 16°. *Lat.* 10° to 12° N.

7. A curved stream, the leading spot larger than the others, with a double nucleus. Two groups of dots, observed by Prof. Pereira on the 5th at 6.36 p.m.
8. Leader with nucleus much subdivided, the f. spots more disconnected.
9. Leader with four nuclei, the stream of f. spots markedly concave towards the equator.
10. Leader split up; f. stream less curved, with many small trailing nuclei.
12. Leader circular both as to nucleus and penumbra, the stream wider, nearly parallel to the equator; small nuclei developing.
13. Spots in three sets, leader with trifid nucleus.
14. Decreasing, but more diffused.
15. The last set much disintegrated.
16. Decidedly on the wane.

Oct. GROUP 223. *Long.* 353°. *Lat.* 23° N.

10. A small spot, new, some distance from E. limb, preceded by faculae on the 9th.
13. Several spots.
13. A stream, one spot increasing.
14. Declining, the largest spot normal, but smaller.
15. Fewer in number.
16. Nearly gone.

Oct. GROUP 224. *Long.* 335°. *Lat.* 8° S.

12. A few indistinct spots 25° E. of the centre of disk.
13. In two sets, very small and widely separated.
14. Three spots. (Prof. Pereira observed two little spots on the 19th in nearly the same position.)

Oct. GROUP 225. *Long.* 15° to 9°. *Lat.* 15° S.

12. Two small spots observed at 6.9 p.m. (Azores.)
13. A nebulous spot, a stream of dots f. (26° E. of centre).
14. Great increase; a leading spot, major axis 30"; a train f., composed of many small nuclei, only a few with penumbra.
15. Leader divided, the f. spots fewer, but larger and more connected.
16. The spots nearly equal in area.

- Oct. GROUP 226. *Long.* 304°. *Lat.* 5° S.
 1. A small spot near E. limb, surrounded by faculae, which the Rev. W. R. Waugh described as appearing to be projected on the limb at 12.30.
 18. Increasing.
 19. More spots.
 20. A stream, the most f. larger and circular, but compound.
 21. No drawing.
 22. Spots all small.
 24. Little change.
- Oct. GROUP 227. *Long.* 307°. *Lat.* 12° N.
 18. A very small spot, two more f. at some distance.
 19. Two spots.
- Oct. GROUP 228. *Long.* 210°. *Lat.* 10° N.
 19. A small spot not far from E. limb.
 20. Penumbra confined to the N.
 21. Not drawn.
 22. Decreasing.
- Oct. GROUP 229. *Long.* 203°. *Lat.* 15° S.
 19. A normal spot near E. limb.
 20. Circular.
 21. No drawing.
 22. Nucleus curved, two faint spots f. at some distance.
 24. Normal.
 25. Major axis 35".
 26. Nucleus more tapering.
 27. Decreasing.
 28. Penumbra wider on the f. side.
 29. Nearing W. limb.
- Oct. GROUP 230. *Long.* 204°. *Lat.* 4° N.
 22. A few little spots in a stream.
 24. One spot.
 25. Decreasing.
 26. Small, nebulous.
 27. Three spots.
 28. Rather more.
- Oct. GROUP 231. *Long.* 176°. *Lat.* 10° S.
 22. A little cluster of very small spots.
 24. More diffuse.
 25. In a stream.
 26. In two sets—a little penumbra.
 27. One small spot, two new ones in advance.
- Oct. GROUP 232. *Long.* 206°. *Lat.* 11° S.
 24. A sparse cluster of small spots.
 25. Fewer.
 26. Two spots only.
- Oct. GROUP 233. *Long.* 165° to 161°. *Lat.* 11° S.
 24. About four faint little spots, far apart.
 25. Three, forming a triangle, two of them pairs.
 26. Two only, nearer each other.
- Oct. GROUP 234. *Long.* 143°. *Lat.* 11° S.
 25. A nebulous spot 47° E. of centre.
 26. Decreasing.
 27. Two little pairs.
- Oct. GROUP 235. *Long.* 177°. *Lat.* 5° N.
 29. A few little spots 35° W. of centre of disk.
- Oct. GROUP 236. *Long.* 77°. *Lat.* 14° N.
 28. A normal spot, small ones f.
 29. Nucleus curved, the f. extending nearly to E. limb.

Nov. GROUP 236—*continued*.

1. Normal, nucleus double.
2. Nucleus trifid.
3. Nucleus more divided.
4. Tapering.
5. Jagged.
6. Normal.
8. Penumbra nearly equal on both sides.
9. Near W. limb.

Oct. GROUP 237. *Long.* 78° to 60°. *Lat.* 7° to 10° S.

28. A small spot in the midst of faculæ.
29. More, forming a scattered stream. The remains of the train 219.

Nov.

1. Very few.
2. One rather larger.
3. Very small spots in two sets, widely separated.
4. One set almost gone.
5. A tiny cluster. (Dots have appeared and disappeared in this region since the 1st.)

Oct. GROUP 238. *Long.* 162°. *Lat.* 13° S.

29. A small spot 24° W. of centre, another f. at some distance.

Oct. GROUP 239. *Long.* 125°. *Lat.* 15° N.

29. A few little spots and dots about 14° E. of centre.

Nov. GROUP 240. *Long.* 118°. *Lat.* 10° S.

1. Two very small spots.

Nov. GROUP 241. *Long.* 51° to 42°. *Lat.* 7° to 10° N.

1. Two spots f. each other, nearly equal in area, almost normal.
2. The p. smaller. (Position of 220.)
3. The f. with cloven nucleus, a cluster of dots f.
4. The p. with penumbra only to the N. Nucleus of f. curved, major axis 30".
5. Each with two nuclei.
6. The p. still smaller, more dots and spots f.
8. The p. gone, nucleus of f. bridged. The followers fewer.
9. No radical change.
10. Nearing W. limb.

Nov. GROUP 242. *Long.* 37° to 24°. *Lat.* 10° to 13° S.

2. A small spot near E. limb.
3. About 12 scattered nuclei.
4. The p. forming a cluster.
5. The cluster only seen.
6. Fewer and more in a stream.
8. Great increase, new spots have burst out in advance, four of them considerable, two with streams of small nuclei. Mr. J. S. Townsend observed a strong reversal of the C. line, with his spectroscope, over a tiny cluster to the N., and slight distortion of it in various other places.
9. Three principal centres of activity, the leading spot distinct, the nuclear streams disappearing; the tiny cluster not seen.
10. Spots decreasing in area.
11. All the p. spots quite small, the last nearly normal, with a trail of dots.
12. Near W. limb.

Nov. GROUP 243. *Long.* 350° to 347°. *Lat.* 3° to 5° S.

4. A penumbral spot near E. limb. Faculæ bright, nucleus divided.
5. Nucleus distinctly double (nearly the position of Group 212).
6. Two small spots f.
9. One or two more outliers.
8. Split in two, major axis of each nearly 30". One spot f.
10. Decreasing in area.
11. One spot only with penumbra.
12. Spots all small, in a curved stream.
13. Four little spots some distance apart, with one much more to the S.
14. One spot only seen.

Nov. GROUP 244. *Long.* 300° to 292°. *Lat.* 4° to 6° S.

8. A very small spot.
9. Two.
10. A few more in a triangle.
11. Hardly larger than dots.
12. Two little spots further apart.
13. Three.

Nov. GROUP 245. *Long.* 347° to 337°. *Lat.* 22° S.

10. A little stream.
11. The leader and final spot much increased.
12. Leader with penumbra only on the p. side, the final with three nuclei, intermediates small.
13. Leader followed by small nuclei, final compound, major axes 25'' and 30''.
14. Leader broken up.
15. Three spots, the final smaller.
16. One; near W. limb.

Nov. GROUP 246. *Long.* 292° to 287°. *Lat.* 11° N.

10. A few very small spots.
11. A stream, the leader larger than the rest.
12. Little change.
13. Leader broken up on the f. side, major axis 30''; small f. spots altered in position.
14. F. spots fast dwindling.
15. Leader still compound.
16. Decreasing.
17. Much reduced, only two spots f.

Nov. GROUP 247. *Long.* 244°. *Lat.* 9° N.

12. A penumbral spot near E. limb.
13. Nearly normal.
14. Circular.
15. Penumbra s. p.
16. Nucleus divided, major axis 20''.
17. Penumbra slight, two dots f. at a distance.
18. Dark, nebulous, just bridged, two dots wider apart.
19. No penumbra.
20. Decreasing.
21. Very small.
22. More normal.

Nov. GROUP 248. *Long.* 220°. *Lat.* 2° N.

14. A penumbral spot near E. limb.
15. Broken up on the f. side; nucleus double.
16. Nucleus quadruple, small spots f.
17. Nucleus entire, curved; more spots with dots f., one quite distant.
18. More tapering; major axis 30''.
19. The f. spots almost gone.
20. Normal.
21. Penumbra only to the E. and W.
22. Latitude more N. by 3°.
23. Very small.

Nov. GROUP 249. *Long.* 212° to 207°. *Lat.* 13° to 14° S.

17. A few little spots N. and S. of each other. (Nearly the positions of 216.)
18. Larger, very dark, more inclined to the equator.
19. Still more equatorial, two principal spots with several nuclei, penumbra one sided, 5° apart; major axes 25'' and 30''.
20. The f. spot broken up.
21. The p. smaller, the f. almost gone.
22. The p. more normal. Distortion of the C. line over faculæ t. the E.
23. Much reduced.
24. Nearly normal.
25. Very insignificant.

Nov. GROUP 250. *Long.* 155°. *Lat.* 13° S.

18. A very small spot near E. limb.
19. Two f. each other.

Nov. GROUP 251. *Long.* 133°. *Lat.* 9° N.

19. A spot close to E. limb, at 4.48 p.m. (Azores).
20. Nearly normal.
21. Nucleus curved eastward.
22. Small spots f.
23. Penumbra wider on the s. f. side.
24. Normal; f. spots in a stream.
25. Major axis 30".
27. Little change.
28. No details.
29. Smaller than when central.
30. Little or no penumbra.

Nov. GROUP 252. *Long.* 143°. *Lat.* 10° S.

19. Two very small spots. (In the same positions as 234.)
20. No observations.
21. One spot.

Nov. GROUP 253. *Long.* 190° to 182°. *Lat.* 19° to 22° S.

21. A spot with penumbra only to the S. Smaller ones f. in a curve, a new outburst, not far E. of centre.
22. Leader with several nuclei, the f. spots increasing.
23. Leader still larger, nucleus divided lengthwise, the upper portion elongated, the f. spots forming an ellipse with penumbra chiefly to the exterior.
24. Leader with nucleus undivided, the elongated extremity in course of separation with small nuclei and penumbra curving upwards; major axis 1' of arc, the ellipse more distant.
25. Leader very fragmentary at the extremity, ellipse compressed.
27. Two principal spots.

Nov. GROUP 254. *Long.* 175°. *Lat.* 11° S.

24. A small normal spot, nearly circular.
25. A pair, no penumbra.

Nov. GROUP 255. *Long.* 150°. *Lat.* 9° S.

23. Two little spots very widely separated, a zigzag of dots between them.
24. One spot, a miniature stream f.
25. Extremely faint.

Nov. GROUP 255A. *Long.* 151°. *Lat.* 7° S.

27. A few very small spots, nearly central.
28. Three in a line.
29. One and a dot.

Nov. GROUP 256. *Long.* 79° to 75°. *Lat.* 10° to 12° N.

28. A sparse cluster of small spots. Seen on the 27th by Prof. Pereira.
29. Fewer, widely separated.
30. One, with slight penumbra.

Dec.

1. A triangular group consisting of small nuclei.
2. The most p. spot larger but with hardly any penumbra.
3. The p. with penumbra on the p. side, f. spots fast decreasing.

Dec. GROUP 256A. *Long.* 89°. *Lat.* 6° S.

1. One or two extremely small spots.
2. One only.
3. Little change.

Nov. GROUP 257. *Long.* 13° to 8° . *Lat.* 7° to 9° N.

29. A small spot near E. limb.
30. Many faculæ around and f.

Dec.

1. Very small.
2. Increasing in number.
3. Leading spot larger, penumbra on the f. side.
4. A stream, spots more equal in area.
5. Curved, many sharp nuclei, a few with penumbra.
7. The f. spot on the wane.
8. Leader normal, about $30''$ major axis, with double nucleus.

Nov. GROUP 258. *Long.* 13° to 5° . *Lat.* 19° S.

29. A penumbral spot near E. limb.
30. Broken up on the f. side, another spot f. nearly equal in area, broken up on the p. side.

Dec.

1. Nuclei of both spots much divided.
2. Leader with a "black hole" dissected by bridges on the s.f. side, penumbral trails adjacent, the f. spot still one-sided, dots in miniature streams p.
3. Leader nearly normal, curved.
4. Tapering, the f. broken up.
5. A rent in the penumbra to the N., major axis $40''$. The f. spots small, in a stream.
6. Nucleus curved.
7. F. spots very few.
8. Nucleus again more irregular.
11. Near W. limb.

Dec. GROUP 259. *Long.* 34° to 27° . *Lat.* 12° to 17° S.

1. An elliptical group, a new outburst, with many small spots and sharp nuclei.
2. Immense increase, two spots full of detail and considerable penumbra, several lesser ones between them. Area, 800 square seconds. Three groups visible on this date have a striking resemblance, each having two principal spots very compound in type, the most f. with penumbra only on the E. side.
3. Much extended in longitude, leader with two almost circular nuclei, the final spot more dispersed.
4. Leader tapering, nucleus single, the final broken up.
5. Leader circular, a small portion of the nucleus detached; the f. spots in a wavy line.
6. Nucleus angular, one spot f.
7. Final spot increased.
8. Leader with double nucleus and penumbra s.f., the only f. spot a small pair.

Dec. GROUP 260. *Long.* 355° . *Lat.* 19° S.

1. Two spots f. Group 259, N. and S. of each other, with a little penumbra.
2. A few following.
3. The largest spot normal, circular, diameter $20''$.
4. Little change.
5. Penumbra only to the S., more outliers.
6. No details.
7. Outliers fewer.
8. Largest spot much reduced, the rest in a stream.
11. Near W. limb; f. spots fewer.

Dec. GROUP 261. *Long.* 323° to 312° . *Lat.* 2° to 6° S.

3. A few little spots near E. limb.
4. A train.
5. The most p. larger than the rest.
6. Not observed.
7. Not observed.
8. Spots in two sets, small, hazy.

Dec. GROUP 262. *Long.* 300° to 295°. *Lat.* 2° to 4° N.

5. A spot not far from E. limb, penumbra slight.
6. Not observed.
- 7.
8. Major axis about 20'', penumbra on the s. p. side.
11. Very small.
12. Two spots, widely separated.
13. A pair.
15. Very faint.

Dec. GROUP 263. *Long.* 332°. *Lat.* 12° N.

8. Two small dark spots widely separated.

Dec. GROUP 264. *Long.* 311° to 301°. *Lat.* 18° to 21° S.

11. New since the 8th, about one day W. of the centre of disk. A fine double train of small spots led by one of considerable size, with two nuclei. Mr. J. S. Townsend observed a reversal of the C. line at different points of the whole length of the group.
12. Leader very complex, opening eastward, major axis 50''. The N. part of the train crowded with little sharp nuclei and irregular patches of penumbra; dots to the S.
13. No details.
15. The leading spot more normal, also the final one, those between much decreased.
16. Near W. limb, one spot in advance followed by several so closely united as to form a singular curve.

Dec. GROUP 265. *Long.* 170° to 159°. *Lat.* 13° to 16° S.

15. A train near E. limb.
16. Spots irregular, about seven with penumbra, the leader the largest.
17. Leader curved eastward, those f. more sub-divided.
18. Nucleus of leader fimbriated, major axis 45'', the f. a wonderful aggregation of small spots with little nuclei and patches of penumbra.
19. Leader tapering, the f. spots more confluent, altered in position with fewer nuclei.
20. Leader cut straight off, as it were, at the f. end, nucleus dense, the f. spots elongated, with nuclei in rows, two at the rear expanded with many dots and sputterings.
21. The f. spots larger but still very fragmentary, positions altered since yesterday.
22. Leader breaking up and curved to the S. Some of the f. more consolidated, but the rest of the train split up into miniature streams, those at the rear now composed of dots and dashes of penumbra.
23. Leader normal, circular, with a narrow tail-like appendage. Two f. spots more definite but very irregular and further from the leader, one of them sharply bridged.
25. Much foreshortened and reduced: the train now quite distinct from the leader, appearing more connected and equalized.

Dec. GROUP 266. *Long.* 147° to 140°. *Lat.* 16° to 18° S.

16. A hazy spot, f. 265.
17. A smaller one to the N.
18. Nucleus double.
19. Little change.
20. Another spot f. at some distance.
21. Nearly normal, the f. dispersed.
22. Nucleus still double, a little stream of dots f.
23. Both nuclei sharply pointed, the stream increased.
25. Much reduced, penumbra only s.f.; the stream with two spots only.
27. One faint spot.

Dec. GROUP 267. *Long.* 199° to 193°. *Lat.* 4° to 6° N.

17. A very small spot about half of sun's radius from centre.
18. Three spots n.f. each other with slight penumbra.
19. One spot and a tiny stream.
20. Fast decreasing.

Dec. GROUP 268. *Long.* 82°. *Lat.* 8° N.

- 20. A very faint spot near E. limb, another more distant.
- 21. Enlarged, signs of division.
- 22. A pair, nearly equal in area.
- 23. Spot to the S. the larger.
- 25. The N. spot the larger.
- 27. Several little spots with hardly any penumbra.
- 28. One spot only conspicuous.

Dec. GROUP 269. *Long.* 119°. *Lat.* 13° S.

- 21. About five very small spots.
- 22. Little change.
- 23. Three spots, two of them increased.
- 25. One only.

Dec. GROUP 270. *Long.* 66° to 58°. *Lat.* 13° to 16° N.

- 23. A few very small spots.
- 25. A pair, somewhat resembling 268. One or two f., and three n.f.
- 27. The f. greatly increased in number.
- 28. Fewer, four with very dark nuclei almost without penumbra.
- 29. More in a line, but decreasing in area, positions altered.
- 30. Smaller.
- 31. Fewer and more widely separated.

Dec. GROUP 271. *Long.* 32°. *Lat.* 15° S.

- 25. A small penumbral spot not far from E. limb.
- 27. Little change.
- 28. No increase.
- 29. Nebulous.
- 30. Decreasing.
- 31. Two small spots.

Dec. GROUP 272. *Long.* 19°. *Lat.* 16° N.

- 27. A faint spot at some distance from E. limb.
- 28. No details.

Dec. GROUP 273. *Long.* 70° to 65°. *Lat.* 4° N.

- 28. Two small spots S. of Group 270.
- 29. More; in the form of an ellipse.
- 30. A stream.
- 31. Decreasing.

Dec. GROUP 274. *Long.* 346°. *Lat.* 17° N.

- 28. A penumbral spot near E. limb.
- 29. Nucleus rather irregular.
- 30. Nucleus double, penumbra gashed on the f. side with two little patches separated.
- 31. Penumbra branching on the f. side at 11.20. At 2 p.m. the Rev. F. J. Eld described the spot as semi-circular with two horn-like projections to the penumbra.

Dec. GROUP 275. *Long.* 73°. *Lat.* 19° S.

- 29. A small nebulous spot W. of the centre of disk.

Dec. GROUP 276. *Long.* 355°. *Lat.* 19° S.

- 31. Two very small spots and a few dots. (Position of 260.)

Dec. GROUP 277. *Long.* 333°. *Lat.* 7° N.

- 31. A small dark spot at some distance from E. limb.

Dec. GROUP 278. *Long.* 316°. *Lat.* 12° N.

- 31. A spot with a little penumbra near E. limb.

Dec. GROUP 279. *Long.* 310°. *Lat.* 17° S.

- 31. A large normal spot near E. limb. (Position of 264.)

GROUP XXII.

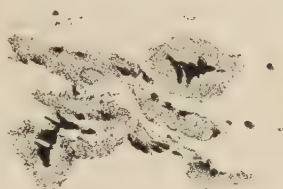


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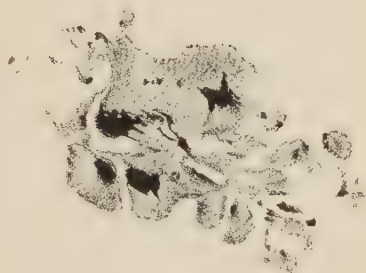


Jan:14.

J. de M. Pereira del.



Jan:15.

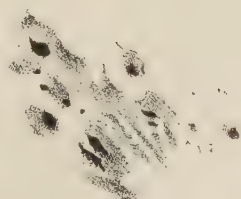


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E.B. del.



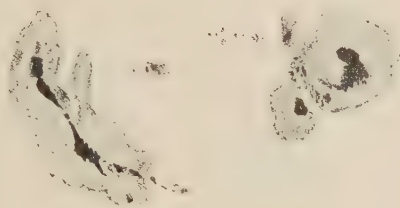
Jan:18.



Jan:20.

H. Corder del.

GROUP LXXVI.



April 1

E.B. del



April 3.

E.B. del



April 5.

E. B. del.



April 7.

10 30. 44^m OG by Projection Sun's diam 25^m

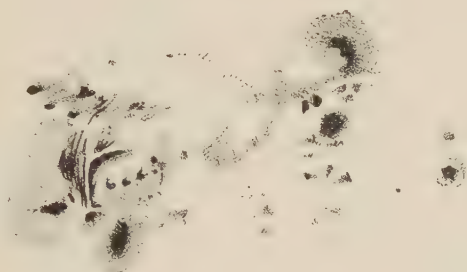
J. de M. Pereira del

GROUP CX.



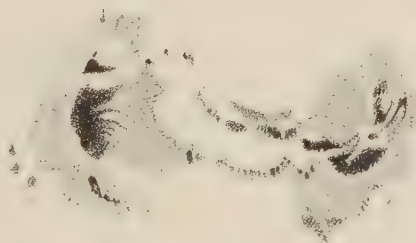
May 14.

J.de M. Pereira del.



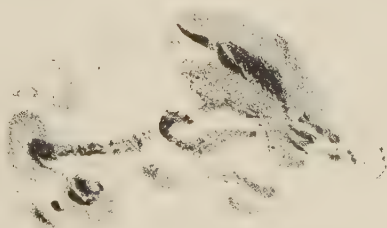
May 16. 9. 24.

J.de M. Pereira del.



May 18. 4. 25.

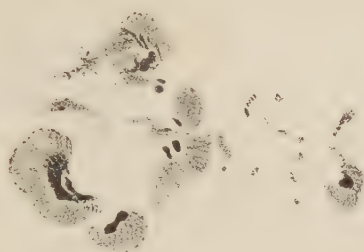
J. de M. Pereira del.



May 19. 9. 20.

J. de M. Pereira del.

GROUP CXIII



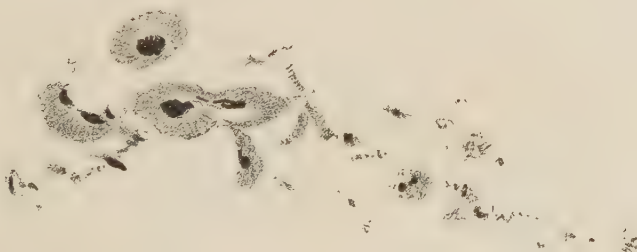
May 14. 6.P.M.

J.de M.Pereira. del.



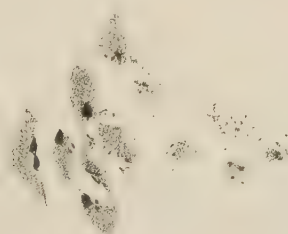
May 16. 9.24.

J.de M.Pereira del.



May 18. 4.15.

E.B. del.



May 21. 9.30.

E.B. del.

GROUP CXXXVII.

June 12. 10

E.B. del.

June 14. 5.45.P.M.

E.B. del.

June 15. 4.30.P.M.

E.B. del.

June 19. 10 A.M.

E.B. del.

W. Limb

June 21. 8.A.M.

E.B. del.

GROUP CXLI.



June 18. 6.30, P.M.

J. de M. Pereira del.



June 20. 5.30, P.M.

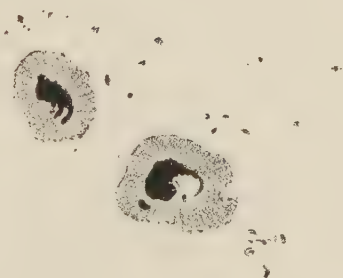
E. B. del.

GROUP CLXVI.



July 13. 5.30, P.M.

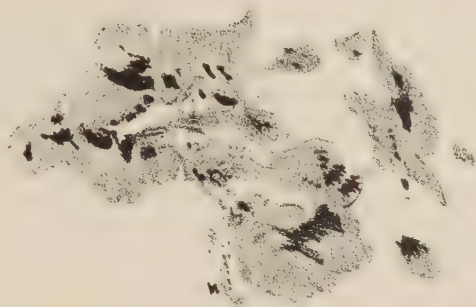
E. B. del.



July 16. 5. P.M.

E. B. del.

GROUP CLXXXVI



Aug: 15. 10,30.

E.B. del.



Aug: 17. 6.P.M.

E.B. del.

GROUP CCII.



Sep: 12. 4,P.M.

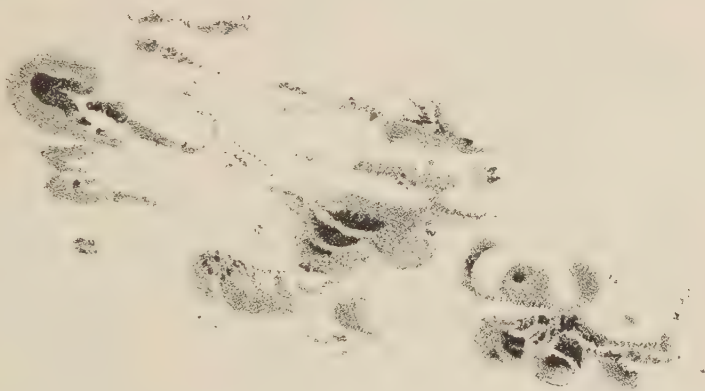
E.B. del.

GROUP CCXIX



Oct. 4. 12.

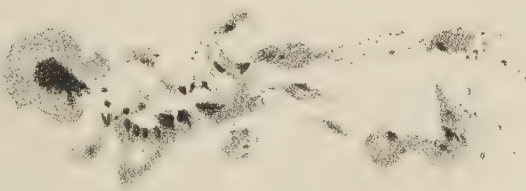
J de M. Pereira. del.



Oct. 7. 12.30.

E.B. del.

GROUP CCLXV.



Dec. 20.

$3\frac{1}{2}^{\text{in}}$ O.G by Projection. Scale. Sun's image 25^{in}

E.B. del.

SECTION FOR THE OBSERVATION

OF

M A R S.

DIRECTOR.—BERNARD E. CAMMELL, F.R.A.S.

REPORT OF THE SECTION, 1894.

Introduction.

The following Table gives the alphabetical list of the Members forming the Section, together with particulars of the instruments used:—

TABLE I.

Name.	Place.	O.G. or Spec.	Aperture in Inches.	Draw- ings.
Antoniadi, E. M. -	France -	O.G.	$9\frac{3}{4}$	12
Baikie, Rev. J., F.R.A.S. -	Roxburghshire -	O.G.	$4\frac{1}{4}$	
Brown, G. L. -	Stirling -	O.G.	$3\frac{1}{4}$	7
Cammell, Barnard S., F.R.A.S.	Wokingham -	Spec.	$10\frac{1}{4}$	6
Cottam, Arthur, F.R.A.S. -	Watford -	Spec.	$12\frac{1}{2}$	6
Davis, G. T. -	Reading -	O.G.	$3\frac{1}{4}$	20
Ellis, Henry -	London -	Spec.	$12\frac{1}{4}$	5
Henderson, Arthur -	Liverpool -	Spec.	$10\frac{3}{4}$	7*
Kempthorne, Rev. P. H. -	Wellington Col- lege.	Spec.	$8\frac{1}{2}$	7
Maunder, E. W., F.R.A.S.	Greenwich -	O.G.	28	5
Mears, T. Willoughby -	Brighton -	O.G.	$3\frac{1}{4}$	5
Mee, Arthur, F.R.A.S. -	Cardiff -	Spec.	$8\frac{1}{3}$	13
Noble, Capt., F.R.A.S. -	Sussex -	O.G.	$4\frac{1}{2}$	5
Patterson, A. Gordon, M.D.	Ascot -	Spec.	10	7
Roberts, C. -	Bournemouth -	Spec.	$6\frac{1}{2}$	22
Saul, Rev. R. Beamish -	Weston - super - Mare.	Spec.	$8\frac{1}{2}$	8
Smart, Dr. D., F.R.A.S. -	Bermondsey, S.E.	Spec.	10	1
Stewart, W. C. -	York -	Spec.	10	1
Taylor, C. A. -	London -	O.G.	2	6
Waugh, Rev. W. R., F.R.A.S.	Portland -	Spec.	$12\frac{1}{2}$	3
Williams, A. Stanley, F.R.A.S.	West Brighton -	Spec.	$6\frac{1}{2}$	8
Wood, J. T. -	Nottingham -	O.G.	$3\frac{3}{4}$	3
		Spec.	10	

* In addition to eight diagrams, and six drawings of Solis Lacus.

TABLE II.

List of drawings made by Members of Mars Section during the opposition of 1894, arranged in order of longitude.

Longitude of Central Meridian.	Date.	Name of Observer.	Reference to Plates.
0	Dec. 16	Wood.	
1	Oct. 2	Beamish Saul.	
3	Aug. 30	Roberts.	
5	Sept. 1	Roberts.	
11	Dec. 15	Davis.	
13	Oct. 1	Baikie.	
19	" 1	Wood.	
22	Dec. 18	Davis.	
25	Oct. 2	Mee.	
30	Aug. 27	Beamish Saul.	
33	Sept. 28	Davis.	
34	Aug. 27	Antoniadi.	
35	Sept. 26	Roberts.	
35	" 27	Roberts.	Plate II., Fig. 7.
35	Aug. 28	Roberts.	
38	Oct. 1	Henderson.	
43	Aug. 29	Roberts.	
47	Sept. 29	Ellis.	
49	Aug. 27	Antoniadi.	Plate II., Fig. 8.
50	Sept. 29	Waugh.	
52	" 28	Kempthorne.	
55	" 26	Baikie.	
55	" 26	Kempthorne.	Plate II., Fig. 9.
57	Aug. 23	Antoniadi.	
58	Sept. 29	Henderson.	
59	" 26	Davis.	
71	" 28	Henderson.	Plate II., Fig. 10.
76	" 27	Cammell.	Plate II., Fig. 11.
91	Oct. 30	Antoniadi.	
97	" 31	Antoniadi.	
100	Nov. 1	Antoniadi.	Plate II., Fig. 12.
104	Sept. 28	Roberts.	
112	Oct. 27	Taylor.	
115	Sept. 18	Davis.	
116	" 17	Roberts.	
118	Aug. 16	Meares.	
118	Oct. 27	Kempthorne.	
130	Sept. 18	Davis.	
131	" 27	Roberts.	Plate III., Fig. 13.
135	" 19	Mee.	Plate III., Fig. 14.
145	Oct. 23	Antoniadi.	
153	Sept. 15	Antoniadi.	Plate III., Fig. 15.
153	Oct. 25	Taylor.	
154	" 21	Brown.	Plate III., Fig. 16.
157	Nov. 30	Beamish Saul.	Plate III., Fig. 17.
160	Oct. 15	Davis.	
167	" 22	Kempthorne.	
167	Sept. 14	Baikie.	
170	" 16	Henderson.	Plate III., Fig. 18.
177	Nov. 25	Mee.	

Longitude of Central Meridian.	Date.	Name of Observer.	Reference to Plates.
180	Sept. 12	- Cammell.	
180	" 19	- Roberts.	
180	Oct. 21	- Patterson.	
182	Nov. 25	- Stanley Williams.	
185	Sept. 13	- Mee.	
186	Oct. 14	- Henderson.	
187	Sept. 11	- Davis.	
190	Oct. 18	- Brown.	
193	Sept. 12	- Baikie.	
194	" 19	- Stanley Williams.	
197	" 11	- Roberts.	
200	" 12	- Mee.	
207	Nov. 25	- Mee.	
210	Oct. 21	- Patterson.	
210	" 21	- Kempthorne.	
213	Aug. 5	- Antoniadi.	
213	Sept. 11	- Stanley Williams.	
214	Oct. 19	- Stanley Williams.	
214	Sept. 20	- Roberts.	
216	Oct. 16	- Patterson.	
217	Sept. 9	- Roberts.	
217	Oct. 22	- Henderson.	
220	Sept. 10	- Mee.	
220	1895, Jan. 1	- Roberts.	
224	Sept. 9	- Meares.	
224	Nov. 18	- Taylor.	
225	Sept. 7	- Davis.	
226	Nov. 22	- Brown.	
226	Oct. 17	- Stanley Williams	- Plate IV., Fig. 19.
228	" 13	- Waugh.	
228	July 1	- Antoniadi.	
229	Sept. 8	- Roberts.	
230	Oct. 16	- Mee	- Plate IV., Fig. 20.
235	Dec. 27	- Beamish Saul.	
237	Nov. 19	- Meares.	
240	Sept. 9	- Stanley Williams.	
240	Oct. 15	- Stanley Williams.	
240	" 16	- Smart.	
241	Sept. 6	- Roberts.	
242	Oct. 16	- Davis.	
242	Sept. 7	- Ellis.	
244	Nov. 23	- Davis	
244	Oct. 15	- Patterson.	
250	" 16	- Kempthorne	- Plate IV., Fig. 21.
252	" 14	- Patterson	- Plate IV., Fig. 22.
252	" 15	- Noble.	
252	" 14	- Wood.	
255	Sept. 6	- Mee.	
255	Dec. 31	- Davis.	
257	Oct. 15	- Cammell	- Plate IV., Fig. 23.
260	Nov. 21	- Noble.	
263	Oct. 12	- Beamish Saul.	
265	" 14	- Kempthorne.	
266	" 11	- Brown	- Plate IV., Fig. 24.
266	" 12	- Patterson.	
267	" 11	- Baikie.	
275	Nov. 17	- Davis.	

Longitude of Central Meridian.	Date.	Name of Observer.	Reference to Plates.
276 ^o	Oct. 10	- Baikie - -	Plate V., Fig. 26.
276	Sept. 5	- Cammell - -	Plate V., Fig. 25.
277	" 7	- Antoniadi - -	Plate V., Fig. 27.
283	" 5	- Meares.	
285	Nov. 18	- Mee.	
286	Sept. 5	- Maunder.	
286	Dec. 27	- Davis.	
287	Oct. 8	- Baikie.	
287	Sept. 1	- Ellis.	
290	Nov. 18	- Meares.	
293	" 18	- Noble.	
293	Sept. 5	- Maunder - -	Plate V., Fig. 28.
295	" 11	- Roberts.	
296	Aug. 31	- Davis.	
296	July 29	- Ellis.	
296	Nov. 19	- Davis.	
299	" 15	- Taylor.	
301	Oct. 7	- Beamish Saul.	
302	" 8	- Noble.	
302	Sept. 10	- Roberts.	
303	Oct. 7	- Patterson.	
304	Nov. 14	- Mee.	
305	Sept. 4	- Henderson.	
305	Oct. 8	- Brown - -	Plate V., Fig. 29.
306	Dec. 18	- Waugh.	
309	Oct. 8	- Beamish Saul.	
309	Aug. 30	- Ellis.	
311	" 23	- Davis.	
315	Oct. 7	- Cammell.	
320	" 8	- Mee - -	Plate V., Fig. 30.
321	Nov. 15	- Noble.	
328	Aug. 31	- Maunder.	
329	" 29	- Cammell - -	Plate I., Fig. 1.
330	Dec. 20	- Beamish Saul.	
330	Nov. 15	- Beamish Saul.	
340	Sept. 5	- Roberts.	
341	Aug. 28	- Antoniadi - -	Plate I., Fig. 2.
341	Sept. 6	- Roberts.	
341	Oct. 2	- Brown - -	Plate I., Fig. 3.
342	" 7	- Taylor.	
343	Aug. 29	- Maunder - -	Plate I., Fig. 4.
347	Nov. 15	- Taylor.	
348	Aug. 29	- Maunder.	
350	" 30	- Roberts - -	Plate I., Fig. 5.
352	Oct. 2	- Davis.	
354	Aug. 30	- Roberts.	
357	Oct. 2	- Davis.	
358	Aug. 29	- Stanley Williams -	Plate I., Fig. 6.
	Nov. 15	- Mee.	

The Director, in issuing this Report, wishes to convey the thanks of the Members of the Section to Dr. Marth for having so kindly assisted them by forwarding his valuable ephemerides, from which all the longitudes of the drawings have been calculated. Also indirectly to Messrs. Percival Lowell, A. E. Douglas,

W. E. Pickering, observing at the Lowell Observatory, Arizona, for their valuable and instructive articles and drawings, which have appeared from time to time in "Astronomy and Astro-Physics," also in "Popular Astronomy." To Mr. J. W. Schæberle at the Lick Observatory for his beautiful drawings of the *Solis Lacus* region, to Herr Leo Brenner for his drawings in the "English Mechanic," and last, but not least, to M. Camille Flammarion for his valuable contributions to Areography in "L'Astronomie."

The Director also wishes personally to thank Mr. Maunder for his assistance so kindly given in helping him with his great experience to draw up the list of instructions issued to Members at the commencement of the apparition, and also by placing at his disposal the list of instructions issued by him when Director of the Section in 1892. And also to Mr. Stanley Williams for his most valuable suggestions and criticisms given from time to time. Coming from one who is so well qualified to speak on everything connected with Mars, they have been of great assistance.

The number of drawings sent in amounts to 156. Mr. Henderson, besides, sent in eight diagrams and six drawing of the *Solis Lacus*, and Mr. Stanley Williams eight diagrams, all of which appear in his report.

No doubt a much larger number would have been available had it not been for the very unpropitious state of the weather; in fact, had not the Members been full of enthusiasm and a determination, in spite of the wretched weather, not to let such a favourable opposition of Mars pass without some good work being done, the Director feels that this Report would have been much curtailed.

The Section may be congratulated on having such skilled observers as Mr. Stanley Williams and Mr. Antoniadi among their number. The latter gentleman was fortunate in having at his disposal, during a part of the season, the fine $9\frac{3}{4}$ -in. O.G. of the Juvisy Observatory. The drawings, however, which he made later in the season, and the observations as well, with only a $4\frac{1}{4}$ -in. O.G. are worthy of great praise.

The present apparition of Mars seems to have fully demonstrated the accuracy of Schiaparelli's observations and maps, a large number of his canals and lakes having been seen, and in some instances canals not hitherto recorded. One noteworthy fact, which seems to be well established, is, that during the present apparition certain well known markings on the planet have been either totally obscured or very much altered in form.

The Director begs to thank all the Members for their very willing assistance and co-operation. He wishes that a more experienced observer than himself had been chosen for the post of Director, as he can only claim to be comparatively a beginner in the study of Mars.

He trusts that any shortcomings on his part will be kindly considered.

Syrtis Minor.

This sea has been drawn unusually large by a great many observers. The smallest instruments have not failed to show this. In fact, in many cases it might easily be mistaken for the *Syrtis Major*.

In the preliminary report issued in Vol. V., No. 3, of the "Journal of the British Astronomical Association" on the work of the Section, attention was called to this point. There seems now to be no doubt that this great enlargement of the *Syrtis Minor* was due to the enormous proportions which the *Canal Amenthes*, leading out of it, assumed. Most of the observers call this canal the *Lethes*, but after due consideration, there appears to be little doubt that it was the *Amenthes* (see preliminary report referred to above). It is also remarkable that this extraordinary increase in size of this canal should have taken place about the same time as the "great cloud formation" over *Mare Cimmerium* and Herschel I. Continent did, namely in October. Also that the *Syrtis Minor* should have begun to regain its normal appearance about the same time as the *Mare Cimmerium*. This point is discussed by Mr. Stanley Williams in his report.

Solis Lacus and neighbouring Region.

The dark spot, *Solis Lacus*, received much attention during the Opposition of 1894. Mr. Henderson made several observations of it, and sent six diagrams to illustrate the changes it underwent.

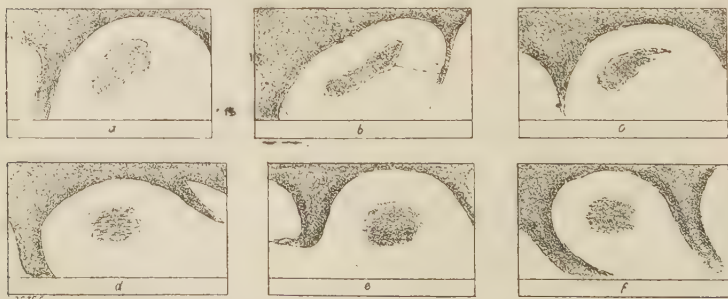
Fig. a., August 22, mere faint diffuse blur; N. of this a reddish-yellow shading which is much duller further N.

Fig. b., September 27, elongated S.E. to N.W., and narrower in the middle portion. *Eosphorus* strongly suspected. *Thaumasia* very bright, where it borders *Mare Erythræum*; the northern portion much duller.

Fig. c., September 28, faint, slightly elongated, narrower towards the E.

Fig. d., September 29, faint, almost round; N. of this a pronounced red tinge as observed before.

Fig. e., October 1, very vague, circular; red tint to N. again prominent.



Changes in the *Solis Lacus*, 1894. (Henderson.)

Mr. Cammell, Mr. Stanley Williams, Mr. Antoniadi, and Mr. Henderson, all report the *Solis Lacus* as appearing elongated E. to W., although the latter on several occasions reports it as circular.

Mr. Antoniadi reports, October 30, *Solis Lacus* central, exceedingly dark, almost black.

The *Aonius Sinus* seems to have been very faint, indeed at times invisible. There is no doubt that the appearance here was quite abnormal. All the above observers agree in this, *Mr. Henderson*, in two drawings of this region, September 29 and September 28, giving no sign of it. Both *Mr. Stanley Williams* and *Mr. Antoniadi* about the same time report that it is either wholly or nearly obscured. This has also since been confirmed by some of the American observers. *Herr Leo Brenner*, on the other hand, a great many of whose drawings have lately appeared in the "English Mechanic," always draws the *Solis Lacus* circular, and the *Aonius Sinus* quite distinct, as it appears in *Schiaparelli's* maps. This disappearance was no doubt due to cloud. (See remarks on this region in preliminary report).

The Director had noticed about the same date that the *Solis Lacus* appeared nearer the p. end of *Thaumasia*, and this no doubt might be accounted for by the *Aonius Sinus* being absent, thereby giving it the appearance of being situated nearer the p. end.

But on careful examination of the drawings to hand, and also from some remarks by *Mr. Antoniadi* (in "L'Astronomie," November 1894, p. 410) and by *Mr. Lowell* (in "Astronomy and Astro-Physics," October 1894, p. 650), it appears that the region called by *Schiaparelli* "*Aurea Chersonesus*" has partially if not wholly vanished. If the drawings of this apparition are compared with those of *Green* in 1877, and also with those of *Schiaparelli*, it seems impossible to avoid the conclusion that a large part of the continent bordering on *Aurora Sinus* has disappeared, and it would, therefore, tend to make the *Solis Lacus* appear out of the centre of *Thaumasia*. Indeed it would actually be so.

Some drawings by *Prof. Holden* with the Lick telescope, published in the "Publications of the Astronomical Society of the Pacific," show *Thaumasia* extremely narrow on the preceding side.

Herr Leo Brenner, however, shows the lake situated as usual in the centre of *Thaumasia*.

Syrtis Major.

The *Rev. W. R. Waugh*, on December 18, and *J. T. Wood* on October 14, both show a small bay, extending into *Aeria*, on the f. side of the *Syrtis Major*, at a point where the *Typhon Canal* debouches. Something similar, although not quite the same, was drawn by *Green* in 1877.

Mr. Wood shows this bay dark and large.

The *Rev. W. R. Waugh* shows it smaller and fainter.

Mare Cimmerium.

During October the *Mare Cimmerium* and a large part of *Herschel I.* continent presented quite an unusual appearance; many observers reporting the *Mare Cimmerium* as quite blotted out, while others again, in attempting to draw this region, report that they were quite unable to satisfactorily identify any of the markings.

There can be very little doubt that those abnormal appearances of the *Mare Cimmerium* and neighbourhood were due to the presence of cloud on Mars.

There seems too, from comparison of the different observations and drawings made about this time, to have been partial openings or thinning of the cloud envelope, especially about the f. end of the *Mare Cimmerium*.

Thus the *Rev. P. H. Kempthorne*, under date October 16, gives the *Mare Cimmerium* as having vanished all but a fragment at the f. end; and on October 22, *Mare Cimmerium* invisible.

Dr. Gordon Paterson gives the *Mare* absent under date October 14, faint October 15, the middle portion absent on October 21, and the rest very indistinct.

Mr. J. T. Wood, on October 14, and *Dr. Smart*, on October 16, also concur as to the disappearance of the *Mare*.

Satellites.

No observations of these minute bodies have been recorded, although one or two observers have suspected faint points of light. When we hear of these most difficult objects being seen at the Manora Observatory by Herr Brenner, with a 7-in. O.G., without even especially looking for them, or taking any means to hide the glare of the planet, in fact being seen quite easily, it appears or might be considered rather a curious circumstance that none of the instruments of the Members of the Section, with the exception, of course, of the 28-in. refractor used by Mr. Maunder, have been equally fortunate in detecting them.

The Weather.

Mr. Cammell (Wokingham) remarks, that "such a wretched autumn for astronomical observations could hardly be conceived; in most parts of the country the heavens were obscured for weeks together by a high bank of clouds, which completely shrouded the sun by day and the stars by night. Definition, which in the early part of the season had at times been fair, seemed in the late autumn to get worse, and night after night the appearance of Mars suggested a boiling mass of red light."

Mr. Maunder (Greenwich) writes on September 26, "Image boiling furiously, the planet very bright, but merely a great flaring naphtha lamp. It was hopeless to attempt a sketch."

Mr. Mee (Cardiff) remarks that "definition was never first-rate, whilst between October 16 and November 14 the

“atmospheric conditions were so bad as to render all seeing “hopeless.”

Mr. Davis (Reading) speaks of the definition on October 2 as very good, and that the details were seen like a picture.

Mr. Antoniadi, observing at Juvisy, France, was favoured with much better weather, and speaks of “Very fine seeing” on August 5, “Very fine weather” on August 27 and 28, and on September 15 “the air is very calm and steady.” His last remark on the weather is, on November 1, “Beautiful definition.”

Colours of Mars.

There is a general agreement amongst the various observers in their remarks on the colours of Mars. All describe the larger continents as more or less orange in tone, and the seas as blue or gray blue, some of them slightly greenish, but, from the bright orange or pink of *Hellas*, to the dusky orange, and faint red grays of other portions of supposed land, there is no great difference in the reports of colour. *Mr. Cammell's* words are these: “On August 30, 1894, Beer continent—orange and bright “orange. October 7, *Syrtis Major*, beautiful blue gray, the darker “seas a beautiful greenish blue of great purity, very difficult to “imitate. On November 19, *Hellas* was bright orange when on “central meridian.”

Mr. Mee describes *Hellas* on the 14th November as fiery red, but on the 16th October as colourless.

Mr. Maunder writes on August 29, that Beer continent was the reddest region visible, and was of a full orange, and describes the seas as a natural gray, the *Sinus Sabæus* being the darkest.

Mr. Davis observed *Hellas* white on the 2nd October and afterwards always ruddy, but the continental regions lost their rosy red tint after the end of November.

Mr. Wood reports colours of continents a decided pink, and the dark blue black or blue gray.

Mr. Roberts saw on September 19 “a very marked green tint “on the *Mare Cimmerium*.”

Changes of Colour.

As in former oppositions, there is a general agreement amongst observers that certain districts change colour as they pass from the central meridian to the terminator. Especially is this the case with regard to the very distinct marking *Hellas* (Lockyer Land). When fully presented, it is, perhaps, the ruddiest region on the planet; when on the terminator it becomes white, sometimes brilliantly so.

On this point the report of the Director, *Mr. Cammell*, may be quoted. “The larger islands in the southern hemisphere, such as *Hellas*, *Argyre*, and *Noachis*, &c., are often a dull greyish orange, but when near the limb are very bright.” The following

are detailed observations:—*Hellas*, August 29, very bright, near terminator; August 30, less bright, more on disk; October 7, dull orange; October 15, near limb, rather bright; November 19, bright orange, on central meridian. *Argyre*, August 26, a whitish patch; September 27, dull orange; October 7, dull orange. *Noachis*, August 26, a whitish patch; August 31, dull greyish orange; October 7, dull orange.

Mr. Mee's observations also supply the following notes with regard to *Hellas*:—*Hellas*, October 7, ill-defined, reddish; October 8, ruddy, smaller than usually drawn; October 12, apparently joined *Ausonia*; October 16, colourless; November 14, very red; November 15, less red when near terminator.

So *Mr. Davis* also reports *Hellas* white and bright on the terminator on September 26 and 28, but later on, in observations at the latter end of October, he mentions that *Hellas* then always appeared ruddy.

The South Polar Cap.

Mr. Cammell observes that the rapid decrease in the size of this cap has been well noted. By the end of October it had practically disappeared. No rifts or outstanding points of light similar to those seen by *Mr. Green* in 1877 have been observed, but nearly all the Members of the Section have recorded the existence of a dark zone or belt surrounding the cap, and some Members mention that on occasions the cap seemed to extend beyond the limb.

Mr. Antoniadi writes on July 1, "S. polar cap is very white and of enormous dimensions, occupying at least 40° areocentric arc, and on November 1 it was glimpsed as a small white speck separated from the limb."

Mr. Henderson describes the polar cap as very brilliant, August 22.

Mr. Maunder remarks that on September 5 the cap was very small and difficult to see.

Mr. Mee, that the cap was very bright between September 19 and October 12, after which it was not observed.

Mr. Henderson, on September 29, describes the S. polar cap as "vivid and very large, and on October 1 seeming to project beyond the limb."

Mr. Antoniadi reports, on October 23, no south polar cap visible.

Mr. Davis says that the S. pole diminished up to October 2, and was not observed again till December 31. He considers that the cap lies towards 60° .

The North Polar Cap.

Mr. Mee speaks of a whitish region towards the north pole on October 2.

Mr. Cammell reports that this cap was visible on December 1 as a brilliant arc of light.

White Spots.

Mr. Cammell remarks that, in addition to those recorded in the preliminary Report, white spots have been observed on the terminator by *Mr. Waugh*, and on December 18 two were seen; one, at about 50° S. latitude, would be situated on the following end of *Argyre*, this spot seemed a narrow streak with a small speck of light, S. of it, and separated from it. On the same night another white spot was suspected at about 20° N. latitude, which would be about the northern end of *Chryse*. On January 1st a small white speck was seen about 65° S. latitude, and on same night a similar spot in the northern hemisphere about latitude 50° .

On January 7, a bright spot was seen on the following end of *Thyle I*.

A careful note of a similar spot and projection will be found in the commencement of *Mr. Williams'* report.

Mr. Henderson describes, on September 4, a very bright spot on terminator, N. latitude about 15° , almost appearing to protrude into unilluminated portion. "Can this be *Nix Atlantica*?" Also, on September 10, some very confused light patches on western terminator.

Mr. Waugh reports, on September 19, a very bright patch N.E. of cap, as if cloud; and on September 29, a similar patch on S.W. On October 13, three irregular white markings in the southern portion of disk, and on November 19, two bright spots on the terminator; seen again on December 18 and January 1.

Mr. Roberts reports, on September 6, a bright spot on *Ausonia*, and on either side of S. end of *Euphrates*, and on September 9, three others visible.

Mr. Henderson writes on October 14, 12^h , 186° . The cloud-like white patches to-night have quite prevented the identification of the markings. October 21, 11^h , 214° . The details blurred out of all identity. October 22, 217° . Details hard to identify through the light patches. With regard to these observations of *Mr. Henderson*, the Director, *Mr. Cammell*, remarks, "the three observations above are worthy of attention, as at this period that portion of the planet which would come well into view under the longitudes given was very much obscured by cloud."

List of Canals and Observers.

(When D follows a name that observer saw it double, or suspected it to be so.)

<i>Aethiops</i>	-	-	<i>Roberts</i> .
<i>Agathodæmon</i>	-	-	<i>Antoniadi</i> , <i>Cammell</i> , <i>Kempthorne</i> , <i>Roberts</i> , <i>Williams</i> , D.
<i>Alpheus</i>	-	-	<i>Antoniadi</i> , <i>Baikie</i> , <i>Cammell</i> , <i>Williams</i> .
<i>Ambrosia</i>	-	-	<i>Antoniadi</i> .
<i>Amenthes</i>	-	-	<i>Baikie</i> , <i>Cammell</i> , <i>Smart</i> , <i>Williams</i> , D.

<i>Anubis</i>	-	-	Cammell.
<i>Araxes</i>	-	-	Antoniadi, Cammell, Roberts, Williams, D.
<i>Astaboras</i>	-	-	Cammell, Roberts.
<i>Astapus</i>	-	-	Antoniadi, Cammell, Henderson, Williams.
<i>Astusapes</i>	-	-	Antoniadi, Cammell.
<i>Cerberus</i>	-	-	Antoniadi, Brown, Cammell, Roberts, Williams, D.
<i>Charontes</i>	-	-	Brown, Cammell, Saul.
<i>Chrysorrhoas</i>	-	-	Antoniadi, Kempthorne, Williams, D.
<i>Cyclops</i>	-	-	Antoniadi, Brown, Williams.
<i>Dardanus</i>	-	-	Roberts.
<i>Deuteronilus</i>	-	-	Roberts.
<i>Eosphorus</i>	-	-	Antoniadi, Henderson, sus. D.
<i>Eumenides</i>	-	-	Antoniadi, Williams, D.
<i>Eunostos</i>	-	-	Roberts, Williams, D.
<i>Euphrates</i>	-	-	Antoniadi, Cammell, Roberts.
<i>Euripus</i>	-	-	Antoniadi.
<i>Fortunæ</i>	-	-	Antoniadi.
<i>Ganges</i>	-	-	Antoniadi, Cammell, Kempthorne, Mee, Roberts, Williams.
<i>Gehon</i>	-	-	Antoniadi, Cammell, Roberts, Saul, Williams.
<i>Gigas</i>	-	-	Antoniadi, Brown, Cammell, sus. D. Roberts, Saul.
<i>Hercules</i>	-	-	Antoniadi, Cammell.
<i>Hiddekel</i>	-	-	Antoniadi, Brown, Cammell, Roberts.
<i>Hydaspes</i>	-	-	Roberts.
<i>Hydrastes</i>	-	-	Antoniadi, Roberts, Williams.
<i>Indus</i>	-	-	Antoniadi, Brown, Henderson, Roberts.
<i>Iris</i>	-	-	Roberts.
<i>Jamuna</i>	-	-	Antoniadi, D. Cammell, D. Henderson, Kempthorne, Roberts, D. Saul Williams.
<i>Lethes</i>	-	-	Antoniadi, Baikie, Kempthorne, Roberts, Saul, Williams.
<i>Læstrygon</i>	-	-	Antoniadi, Brown, Saul.
<i>Nectar</i>	-	-	Antoniadi, Kempthorne, Williams.
<i>Nepenthes</i>	-	-	Antoniadi, Cammell, Henderson, Williams.
<i>Orcus</i>	-	-	Antoniadi, Brown, D. Roberts, Williams, sus. D.
<i>Orontes</i>	-	-	Antoniadi, Brown, D. Cammell, Patterson, Roberts, Williams.
<i>Oxus</i>	-	-	Roberts.
<i>Peneus</i>	-	-	Antoniadi, Williams.
<i>Phasis</i>	-	-	Antoniadi, Cammell, Henderson, Roberts, Williams.
<i>Phison</i>	-	-	Antoniadi, Roberts, Williams.
<i>Phlegethon</i>	-	-	Roberts.
<i>Pyrophlethon</i>	-	-	Antoniadi.
<i>Sirenum</i>	-	-	Antoniadi, Brown, Cammell, sus. D. Roberts.
<i>Tartarus</i>	-	-	Antoniadi, Brown, Cammell, Roberts.
<i>Thoth</i>	-	-	Williams.
<i>Titan</i>	-	-	Antoniadi, Brown, Henderson, Roberts, Saul, Williams, D.
<i>Triton</i>	-	-	Cammell, Roberts, Williams.

<i>Typhon</i>	-	-	Cammell, Maunder, Patterson, Saul, Wood.
<i>Typhonius</i>	-	-	Antoniadi, Brown, D. Williams.
<i>Uranus</i>	-	-	Antoniadi, Cammell, sus. D.
<i>Xanthus</i>	-	-	Antoniadi, Patterson, Roberts.

The Director, Mr. Cammell, remarks that the number of canals seen was 27. The *Jamuna* was the only canal distinctly seen double, *Gehon* and the *Ganges* were suspected double. *Anubis*, *Astusapus*, and *Astaboras* were seen as one shaded patch. The canals were never seen very sharp or dark with the exception of the *Ganges*, which on several occasions was almost black.

Mr. Roberts speaks of the markings being hard and sharply defined when definition was good.

Mr. Antoniadi, after enumerating 42 canals, mentions a new canal, seen on November 1, not figured by Schiaparelli, but seen by the Lick observers in 1892.

The most exact observations of the canals are by Mr. Stanley Williams. His report is printed in full.

Report of A. Stanley Williams, F.R.A.S.

The telescope employed was a $6\frac{1}{2}$ -in. Calver reflector, the usual powers being 225 and 320. Place; West Brighton, Sussex.

Irregularities of the Terminator.—On three occasions irregularities were noticed at the terminator of the planet when in phase. As these irregularities have been exciting considerable attention lately, it may be as well to give the observations relating to them pretty fully.

(a.) 1894, August 18, 13^h 20^m G.M.T.—A brilliant little projection was observed at the terminator, its appearance and approximate position relative to the S. polar cap being as shown in Fig. A. The bright little arm projected obliquely with respect

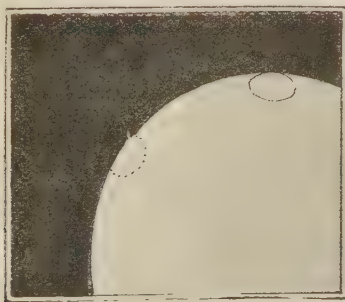


Fig. A. 1894, Aug. 18, 13^h 20^m.

Bright projection on the terminator of Mars.

to the line of the terminator, and the surface adjacent to it just within the terminator was also bright. Cloud coming up almost directly, rendered it impossible to fix the position of this projection with any exactness. It was probably situated somewhere about the south part of *Argyre*.

(b.) 1894, August 29, 12^h to 17^h.—The curve of the terminator was distinctly not regular on this night, though no projections

could be seen. In particular, at one time, when the *Syrtis Major* must have been upon the terminator and just passing off the disk, the limb at this place seemed distinctly flattened. This could not have been an effect of contrast, for none of the dark surface of the *Syrtis Major* could then be seen, the bright continental region *Aeria* apparently extending right up to the limb.

(c.) 1894, September 6, 12^h 7^m.—A minute bright projection was visible at the terminator. At 12^h 23^m its position angle, measured by the micrometer from the apparent centre of the illuminated disk was 243°·4.

12^h 37^m.—The projection seemed more difficult. Besides being very bright, it was very white. It distinctly projected beyond the terminator, almost at right angles to it, but with a slight inclination towards the south. There was a small very white spot just within the terminator, from which the projection seemed to start. See Fig. B.



Fig. B. 1894, Sept. 6, 12^h 23^m.
Bright projection on the terminator of Mars.

12^h 46^m.—The projection could still be seen. The S. coast of Hesperia pointed just south of it. Hesperia seemed to go right up to the white spot at the base of the projection.

13^h 3^m.—The projection could no longer be seen, though there was still a slight brightness and whiteness at the terminator, at the place of the projection.

September 7 proved cloudy, whilst on the 8th definition was too poor for delicate observations. The projection was suspected feebly at times. On September 9 the seeing was very fair, and a careful watch was kept for the projection at the time corresponding to the observations of September 6, but no trace of it could be seen, nor was there even any white spot visible at the terminator.

The invisibility of either the white spot within the terminator or of the projection on September 9, seems to indicate that the latter was due to a mass of cloud, and not to any actual permanent irregularity at the surface of Mars. This is rendered more probable from the circumstance that this region of the planet was undoubtedly densely obscured by cloud in October.

Syrtis Minor.—This region, selected by Mr. Cammell as one of the points requiring special attention, proved in 1894 the scene of some very extraordinary changes.

In September the *Syrtis Minor* was very well-defined, but seemed to be about in a normal state, as shown in Schiaparelli's map. The canals *Lethes* and *Amenthes*, which fall into it, were seen, but they were not conspicuous. When, however, this region came under observation again in October, the *Amenthes* had assumed enormous proportions, so as quite to alter the appearance of this part of the planet, as will be seen from the following observations:—

1894, October 12, 9^h 40^m to 9^h 50^m.—Cloud nearly continuous, so that only a few glimpses could be obtained. The *Syrtis Minor* was continued northward by a very prominent canal (*Amenthes*), which appeared to be double as roughly shown in Fig. C. The

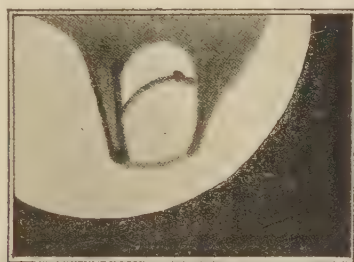


Fig. C. *Syrtis Minor*.—1894, Oct. 12, 9^h 40^m.

duplicity of this canal was of the kind termed “anomalous” by Schiaparelli, the component streaks not being parallel, but wider apart on the south. The space between the two streaks was also strongly dark. The canal *Nepenthes* appeared extremely dark and definite, like a line ruled with pen and ink.

October 14, 10^h 10^m to 10^h 45^m. The appearance on this night is shown in Fig. D, in which *a* = *Mare Cimmerium*, with a darker

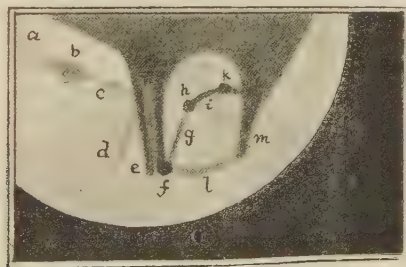


Fig. D. *Syrtis Minor*.—1894, Oct. 14, 10^h 45^m.

spot *b* at its f. end, *c* = *Triton*, *d* = *Lethes*, *e* = *Amenthes*, *f* a minute dark spot or lake, *g* = *Thoth*, *h* = *Lacus Tritonis*, *i* = *Nepenthes*, *k* = *Lacus Mæris*, *l* = *Astapus* (or *Boreosyrtis*?), *m* = *Syrtis Major*. The *Lethes*, however, was not quite certain.

October 15, 9^h 45^m to 10^h 15^m. The *Amenthes* was seen as a very broad, very dark, well defined streak, and was plainly double,

much as on the 14th, with the *Thoth* narrow, dark, and definite. At 11^h 50^m *Lethes* was seen going off at a slight angle to the double *Amenthes* to a faint dark spot, which was probably *Hephæstus*.

October 16, 10^h 15^m. Although def. was bad the *Amenthes* was seen double.

At its third apparition in November the *Syrtis Minor* region had nearly regained its normal aspect. On several occasions the *Amenthes* was visible, but it was feeble and inconspicuous. Only upon one night (November 21, 10^h 0^m) it was described as appearing broad and dark, and perhaps double. In considering the probable cause of such extraordinary changes, it is important to bear in mind that in October, when the abnormal variations occurred, the whole region to the E. of *Syrtis Minor* was evidently more or less thickly obscured or affected by cloud. And, as Mr. Maunder has pointed out in his article on the Canals of Mars in the November number of "Knowledge," the presence of cloud might easily produce very considerable *apparent* changes simply by altering the contrasts. Whilst in November, when the clouds had nearly if not entirely disappeared from this part of the planet, the region about the *Syrtis Minor* had also resumed in great measure its normal aspect.

Atlantis.—The curious narrow bright streak thus named in Schiaparelli's map was well seen upon several nights, though on September 19 at 15^h 40^m it was incomplete, the westernmost half only being visible. Atlantis has always appeared most conspicuous when close to the preceding limb of Mars. This was particularly the case in November 1894, when the Martian atmosphere seems to have been exceptionally clear over this part of the planet. The appearance as seen on November 23 at 9^h 45^m is shown in Fig. E, Atlantis being broad and remarkably bright and well defined.

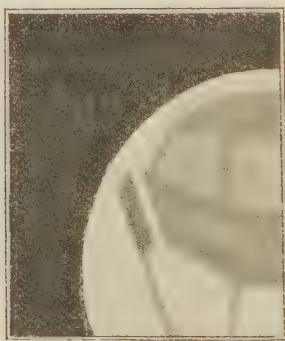


Fig. E. *Atlantis*.—1894, Nov. 23, 9^h 45^m.

Hellas.—The canal *Alpheus* traversing this island from N. to S. was often visible, the other canal, *Peneus*, being less frequently seen. Only upon rare occasions were both canals visible together. Upon several nights a small dark spot or lake was also observed

in the middle of *Hellas*, at the point of intersection of these two canals. On one or two occasions the preceding mouth of the *Peneus* appeared bell-shaped. Fig. F. represents the appearance

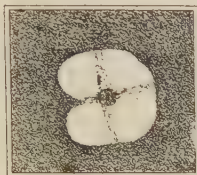


Fig. F. *Hellas*.—1894, Nov. 16.

of *Hellas* as seen on November 16 during a few glimpses through nearly continuous cloud. On this night, contrary to its usual custom, the *Peneus* was more easily seen than the *Alpheus*.

Canals.—About 60 canals were observed in 1894, including most of those shown on Schiaparelli's map that are situate S. of N. lat. 30° . The most remarkable instance of invisibility of a known canal occurred in the case of the *Hydaspes*. Although often looked for, not the slightest trace of this canal could ever be seen. The canals seen differed greatly in their appearance from one another. Indeed, it may be said that no two of them were exactly alike. Some appeared as narrow, very definite streaks, so dark as to appear almost black, and nearly uniform in width, *Phison*, *Orontes*, *Typhonius*, and *Nepenthes* were of this appearance. The last-named, as seen in October, bore considerable resemblance to the Cassini division of Saturn's ring when well open, on account of its curved form, and probably was not very much more difficult to see. Others, whilst retaining the blackness and definiteness of the former class of canals, had yet considerable breadth. As instances, *Nectar* and that part of *Agathodæmon* which runs in a s.p. direction from *Lacus Tithonius* may be mentioned. A third kind appeared as a more or less faint, indefinite, and often obviously irregular streak. This was, in fact, the appearance of the *average* canal as seen in 1894.* They were of very various degrees of breadth, ranging from broad, diffuse bands, like the *Ganges*, to mere lines of no visible breadth. Most of these canals, when observed under favourable circumstances, were obviously irregular on the edges and of uneven intensity. Thirteen canals were seen double in 1894. As everything connected with the duplication of the canals is of special importance, the details concerning them are given below.

Agathodæmon.—See under *Solis Lacus*.

Amenthes.—See under *Syrtis Minor*, *supra*.

Araxes.—See under *Solis Lacus*.

Cerberus, *Cyclops*.—These two canals constitute the greater part of the Huggins Inlet of Proctor's "Map of Mars."

* Although the average canals are here called "faint," it must not be supposed that they were very difficult objects. On the contrary, these average canals were easily seen upon any pretty good night.

September 8, *Cyclops* and *Cerberus* seen plainly, and though def. was very poor they were suspected double. September 9, both canals plainly double. *Cerberus* was very intense, almost blackish; *Cyclops* considerably fainter, though quite evident. September 11, def. pretty good. *Cyclops* rather faint, but distinctly double. It made a considerable angle with *Cerberus*. At its mouth there was a distinct bay. *Cerberus* rather dark and plainly seen double, though the interval between the components was very small. September 18, though def. was very bad, both canals were seen plainly towards the f. limb, and were, moreover, seen double quite distinctly. September 19, *Cyclops* moderately dark, broad, clearly double, yellowish grey in tint; *Cerberus* dark, broad, very plainly double, more blackish than *Cyclops*. In October this portion of Mars was enveloped in cloud, and both canals were invisible. Only on October 19 the mouth of *Cyclops* could be faintly seen. The November observations were unsatisfactory, but on the 23rd *Cyclops* was noted as being very faint.

Chrysorrhoas.—August 26, seen distinctly, narrow and definite. September 26, dark, well defined, rather broad, plain, almost certainly double. September 28, quite plain, though not certainly double, def. very poor. September 29, def. very fair, canal certainly double, the s.p. component being rather narrower and fainter than the n.f. one. A bright yellow streak was visible crossing the canal almost at right angles. At first sight this bright yellow streak seemed to obliterate the double *Chrysorrhoas*, but on closer scrutiny the two bands of the canal could just be traced across the yellow streak. Rather curiously traces of the yellow streak were still visible a month later. November 4, *Chrysorrhoas* plain, moderately dark, certainly double. November 5, distinctly double, though narrower, and not so conspicuous as the *Ganges*. The component lines were distinct, and the space between them bright (see Fig G.). When best seen both components of this

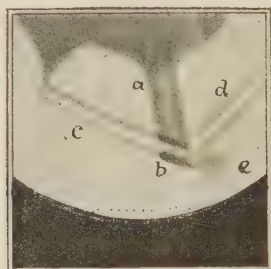


Fig. G. *Lacus Lunæ*.—1894, Nov. 5.

canal were obviously irregular on the edges, and spotty in appearance.

Eumenides-Orcus.—On September 23 and 26 *Eumenides* was seen, but it was faint, indefinite, and inconspicuous. On November 23 and 24 *Orcus* was rather dark, broad, and definite, and strongly suspected to be double. On November 25 the duplicity of the *Eumenides-Orcus* was certain, though not very distinct.

Eunostos.—Seen plainly double on September 9 and 11 from its junction with *Cyclops* as far as the end of *Elysium*. From thence it was narrower, feebler, and single. It was greyish, and not very dark.

Ganges.—This canal was composed of two rather broad, diffuse, parallel streaks of a yellowish grey tint, the two streaks being rather widely separated. The space between was not bright, but of a yellowish grey, somewhat paler than the streaks themselves. The whole formation was rather faint, diffuse, and indefinite, though from its large size the canal was a conspicuous object; and owing to its components being widely separated it could easily be seen double on almost any night, however bad. At its mouth it widened out, so as to form a distinct bay or inlet from the *Aurora Sinus*. It will be seen from Fig. G. and the drawing of the *Solis Lacus* region on p. 126, that the *Ganges* was not double exactly in the same manner as described by Schiaparelli. According to this observer, the duplicity was formed by a new canal through *Fons Juventæ* appearing to the right of the old single canal. But in 1894 both components of the double *Ganges* were to the left of the place of *Fons Juventæ*. The following are the dates on which the *Ganges* was seen double distinctly in 1894:—August 29; September 26, 27, 28, 29, 30; November 4, 5. At the N. end of the *Ganges*, *Lacus Lunæ* appeared as a small, definite, dark spot. On November 5 this lake was seen clearly double, as shown in Fig. G. The duplication was rather curiously not related to the conspicuously double *Ganges*, but to the relatively very feeble double *Hydrastes*, the double lake appearing merely as thickenings and intensifications of the two lines of the latter.

Gehon.—Seen double clearly with power 320 on August 29. The new component started from the p. inlet of Dawes' Forked Bay, and continued parallel to the original canal, following the curve of the latter. The space between the two components appeared greyish, and this greyish appearance also affected *Fastigium Aryn*, rendering the forked character of Dawes' Forked Bay less obvious at this time than usual. The bay itself appeared almost black, immensely darker than the two streaks of the *Gehon*. The p. streak was slightly more feeble than the f. one. The canal was also seen double on October 3 and 7.

Hydrastes.—Distinctly double on September 29, the component canals being narrow and well separated, but not very dark. Also double on September 30, when it was thought to be plainer than on the 29th. On November 5 it was seen clearly double, as shown in Fig. G, in which *a* = *Ganges*, *b* = *Lacus Lunæ*, *c* = *Hydrastes*, *d* = *Chrysorrhoas*, *e* = *Nilus*. The last-named appeared dark and plain, but it was too close to the limb to say if it was double or not.

Titan.—Strongly suspected double on November 23, but def. was bad. On November 25 a large, faint, indefinite, dark patch was seen at the place where the canals *Orcus*, *Eumenides*, *Avernus*, and *Titan* meet or cross. S. of this patch *Titan* was faint, but broad and distinctly double. N. of it the canal was

very faint, and probably, though not certainly, double. In an interesting drawing by Mr. Lowell, made with an 18-in. refractor,* the above-mentioned patch is resolved into a triangle of three small dark spots or lakes.



Longitude about 90° .

Fig. H. *Solis Lacus*.—1894, September 23, 26, and 29.

- | | |
|------------------------------|--------------------------------|
| 1 = <i>Lacus Phœnicis</i> , | 8 = <i>Chrysorrhoas</i> . |
| 2 = <i>Lacus Tithonius</i> . | 9 = <i>Ganges</i> . |
| 3 = <i>Lacus Lunæ</i> . | 10 = <i>Nectar</i> . |
| 4 = <i>Mare Sirenum</i> . | 11 = (<i>Unnamed canal</i> .) |
| 5 = <i>Phasis</i> . | 12 = <i>Iris</i> . |
| 6 = <i>Araxes</i> . | 13 = <i>Ceraunius</i> . |
| 7 = <i>Agathodæmon</i> . | 14 = <i>Uranus?</i> |

Solis Lacus and neighbouring region.—Some pretty good views were obtained of this part of the planet on several nights in the latter part of September. The principal markings then seen have been laid down in the drawing published on p. 150, Vol. V., of the "Journal," which drawing is also reproduced here. Further details are given in the following notes.

September 23, 11^h to 12^h 10^m.—Def. pretty good, but cloud nearly continuous. *Solis Lacus* appeared rather dark and of a peculiar inky tint. It was pear-shaped, the stalk of the pear being formed by the *Nectar*, which was dark and definite. The unnamed canal 11 was also dark, definite, and well marked. This canal was discovered by Burton in 1879, in which year it was strangely missed by Schiaparelli.

September 26, 11^h 20^m to 12^h 20^m.—Def. fair, but unsteady. *Solis Lacus* very dark and inky-looking, but its surroundings were so dusky that it was not a very prominent object. *Thaumasia* between the *Nectar* and the unnamed Canal 11 was dark and strongly reddish. *Nectar* broad, very dark, very well defined. Canal 11 plain, dark, very well defined.

* "Astronomy and Astro-physics," December 1894, Plate XLII., Fig. 7.

September 29, 14^h to 15^h.—Def. fair, but obs. interrupted by cloud. *Solis Lacus* very dark and inky-looking, but owing to *Thaumasias* being dark and ruddy, it was not very prominent. It was much elongated E. and W. *Nectar* broad, very dark, very well defined. Canal 11 moderately dark, well defined. The *Eosphorus* was invisible, and no other canals could be seen issuing from the lake.

October 28, 7^h 35^m to 7^h 50^m.—Def. pretty good, but obs. interrupted by cloud. *Solis Lacus* only moderately dark, though blackish in tint. Once it appeared double, or divided into two by a light streak running from n.p. to s.f., and making an angle of about 45° with a meridian line through the centre of the lake. Owing to cloud it was impossible to confirm this. The *Eosphorus* plainly visible, though in September it could not be seen. It was dark, well defined, conspicuous.

November 4, 9^h 50^m to 10^h 30^m.—*Thaumasias* quite dull and inconspicuous, and not clearly defined on its s.p. side. *Solis Lacus* inconspicuous on account of the dulness of *Thaumasias*.

December 1, 5^h 45^m to 6^h 50^m.—Def. poor. *Solis Lacus* seen as a very black-looking spot, with *Nectar* as a very black-looking streak.

It sometimes happens that certain markings, probably from some peculiarity of appearance, are more easily apparent to some observers than to others. This has been the case here with the canal *Ambrosia*, of which I could never see a trace, although it has been well observed by both M. Antoniadi and Herr Brenner. On the other hand neither of these two observers appears to have seen the unnamed canal 11 more to the E.; and, as already mentioned, this last-mentioned canal was missed by Schiaparelli in 1879, although seen by Burton.

The following notes relate to the double canals *Agathodæmon* and *Araxes* :—

September 23.—*Agathodæmon* distinctly double, the component lines being very dark and definite. *Araxes* also double, but not so plain or so dark.

September '26.—*Agathodæmon* broad, dark, very clearly double, well-defined. *Araxes* seen beautifully double, but closer than the other. It was broad, dark, well-defined.

September 27.—*Agathodæmon* very intensely double, the duplicity being obvious, although def. was poor.

September 29.—*Agathodæmon* broad, very dark, well-defined, double. *Araxes* narrower, very dark, very well-defined, also double.

October 28.—*Agathodæmon* very dark, definite, and double; but *Araxes* was quite faint and inconspicuous, in great contrast to its September appearance. It was slightly suspected to be double. *Lacus Phœnicis* too was faint compared with what it was in September. The faintness of these two markings was perhaps due to thin cloud, the remains of some of that which blotted out the f. part of the *Mare Sirenum* and the *M. Cimmerium* earlier in the month.

In September the *Phasis* was extremely feeble, and the *Aonius Sinus* almost invisible, the surface about here being bright and white, and I quite agree with M. Antoniadi in ascribing this abnormal appearance to the presence of clouds on Mars. Cloud appears in fact to be much more common upon Mars than has been supposed to be the case by some observers of late years, though when present it may not always be dense or continuous enough to absolutely hide the surface markings.

Report of E. M. Antoniadi.

I. JUVISY OBSERVATIONS.

9 $\frac{3}{4}$ in. O.G. Power 220.

Greenwich Mean Time is used in all cases.

July 1, 15^h 50^m, diameter 10''·9, $\lambda = 228^\circ$.—Good def. The S. polar cap is very white and of enormous dimensions; its diameter occupying at least 40° (areocentric arc). *Mare Cimmerium* is on the central meridian. To the right, *Hesperia*, also *Syrtis Minor* and *Mare Tyrrhenum*. *Ausonia* is badly defined and very white in the vicinity of E. limb. (The canals *Cyclops* and *Cerberus* are easily seen. Drawing made.)

August 5, 12^h 50^m, diameter 14''·0, $\lambda = 213^\circ$.—Very fine seeing. The S. polar cap is not very brilliant. *Mare Cimmerium* is on the central meridian. To the E. *Mare Tyrrhenum* with *Hesperia*. To the W., the eastern extremity of *Mare Sirenum* with *Atlantis*. All the region to the S. is badly defined. *Zephyria* looks very white on terminator; so also *Ausonia*. (The canals *Cyclops*, *Cerberus*, and *Laestrygon*, are visible without difficulty. Drawing made).

August 23, 11^h 50^m, diameter 16''·1, $\lambda = 28^\circ$.—Good def. The S. polar cap is now very reduced, and is bordered by a dark belt. *Aromatum Prom.* is almost on the central meridian. *Auroræ Sinus* is dark, *Margaritifer Sinus* considerably lighter, *Noachis*, *Argyre*, *Ogygis Regio* are seen as one land extending up to the terminator. The *Ganges* is much darker than the *Indus*. Drawing made.

August 27, 14^h 50^m, diameter 16''·7, $\lambda = 34^\circ$.—Very fine weather. The S. polar cap is roughly triangular; subtends some 12° (areocentric arc). *Auroræ Sinus* is dark, *Lacus Niliacus* is a plain feature near the N. limb, where the snow extends down to + 55° of latitude in *Tempe*.

August 27, 15^h 50^m, $\lambda = 49^\circ$.—Def. good. *Margaritifer Sinus* with the *Indus* is setting on the terminator, while *Auroræ Sinus* is now central. The N. snows on *Tempe* are very brilliant, though reduced to a simple arc. Drawing made.

August 28, 11^h 50^m, diameter 16''·8, $\lambda = 341^\circ$.—Fine weather. *Sinus Sabæus* is very dark, especially towards "Dawes' Forked Bay" and the mouth of the *Euphrates*. *Deucalionis Regio* is easy, but *Pyrrhæ Regio* is almost invisible. Drawing made.

September 7, $13^h 51^m$, diameter $18''.3$, $\lambda = 277^\circ$.—Very fine seeing. The S. polar cap is very small. *Syrtis Major* is very dark, especially towards its N. end and the *Nilosyrtis*. *Ausonia* indistinct. *Hellas* a little better defined, shows from time to time the curious cross formed by the intersection of the canals *Alpheus* and *Peneus*. The *Syrtis Minor* is dark, receiving the *Lethes* from the N. *Lacus Mæris* is easy. Drawing made.

September 15, $10^h 21^m$, diameter $19''.3$, $\gamma = 153^\circ$. The air is very calm and steady. Fine seeing. The S. polar cap is very narrow and difficult; it is probably excentric to the areographic pole, being now on the other side of it. *Electris* and *Eridania* are white on E. limb. Drawing made.

October 31, $9^h 51^m$, diameter $20''.4$, $\lambda = 97^\circ$.—Good def. The S. polar cap is almost invisible. *Solis Lacus* has passed the central meridian; it is very dark, and elongated from E. to W., or rather from E.S.E. to W.N.W. *Aurora Sinus* appears lighter than usual, and the *Mare Australe* S. of *Thaumasia* is almost indistinct. *Thaumasia* is probably shaded, presenting a colour fully comparable to the dark brick red of *Deucalionis R.*, *Noachis*, &c. *Aoniæ Sinus* is quite invisible, and as much might be said of all the region S.E. of *Solis Lacus*.

November 1, $10^h 51^m$, diameter $20''.2$, $\lambda = 100^\circ$.—Beautiful def. The S. polar cap is glimpsed from time to time as a small white spec separated from the limb. The *Solis Lacus* is so dark that it appears sometimes black near the central meridian; it is distinctly elongated from E. to W. (E.S.E. to W.N.W.). *Aurora Sinus* and *Mare Australe* well defined, but the *Aoniæ Sinus* and *Icaria R.* are scarcely recognised as compared with Schiaparelli's maps. *Thaumasia* somewhat dusky. *Argyre* is very white near the S.W. limb, and so are the northern snows in *Tempe* also. Drawing made.

II. PARIS OBSERVATIONS.

$4\frac{1}{4}$ -in. O.G. . Power 200.

October 23, $8^h 21^m$, diameter $21''.5$, $\lambda = 145^\circ$.—Glorious night. No S. polar cap visible. *Mare Sirenum* is on the central meridian. *Sinus Titanum* very dark.

October 30, $8^h 51^m$, diameter $20''.5$, $\lambda = 91^\circ$.—Air very steady. No S. polar cap visible. *Solis Lacus* central, it is exceedingly dark, almost black by moments. *Aurora Sinus* looks lighter, also the sea surrounding *Thaumasia*.

Report of E. Walter Maunder, F.R.A.S.

Instrument used, 28-in. Refractor.

August 29, $13^h 20^m$ and $13^h 40^m$. Power 360.—Two sketches made. Dawes Forked Bay distinctly seen, the two estuaries being clearly discovered, but the two canals flowing into them were not seen.

Deucalionis R. was also distinctly seen, and the isthmus fully made out. The marking appeared as shown by Schiaparelli and not like Phillips Island in Green's map.

The *Terminator* was diffused and quite unlike the full limb in appearance. No irregularity or projection was, however, detected upon it.

The polar cap was of a perfectly regular elliptical outline; very bright, no indentations. The sea round it was dark for a narrow space.

Herschel II. Strait was the darkest marking on the planet. It was closed at the following end by *Deucalionis Regio*.

The entire district between the pole and *Herschel II.* strait was less bright than Beer Continent, and at the first casual view appeared of one uniform tint. Closer inspection showed that the region was filled with markings of perfectly definite outline, but of such delicate differences of tone and shade as to defy reproduction.

The *Fastigium Aryn*, though distinctly seen, was of a lighter tint than the neighbouring Continent, and the old representation of *Mädler* showing the strait ending in a circular knob would have been quite justified if the planet had been less well seen.

Similarly Phillips Island, though clearly and distinctly united by a well defined isthmus to Beer Continent, was occasionally seen as a cigar shaped island as in Green's chart, owing to the isthmus being fainter than the island.

So too the *De la Rue* Ocean to the south of *Chryse* showed at least two regions of definite outline but of delicate differences of tone.

Proctor Cape was very bright = W_3 ; *Argyre* whitish = W_1 ; the polar cap being W_4 .

Noachis was of a half tint. Beer Continent was the reddest region visible and was of a full orange. The *Terminator* was not so bright or so white as the full limb.

August 31, 13^h 32^m. One sketch made. Power 500.—The polar spot was not so sharp and well defined as on August 29. A few ill-defined white markings were seen close below the polar spot near the central meridian. The markings were of W_3 intensity, but small and with diffused edges, so that they were very difficult to hold, and the few scratches put in to represent them are simply to give their general effect.

The Hook at the *Hammonis Cornu* was only suspected, not steadily seen, so is not given in the sketch.

Proctor Cape was less bright than on August 29, and less distinctly white, say W_2 . Miss Russell, who observed the planet at the same time, but who made no sketch, detected a narrow white line stretching across the *Sabæus Sinus* from Proctor Cape. I could detect nothing of the kind.

Beer Continent was more distinctly ruddy than on August 30.

The difference in aspect between the terminator and the limb was very marked. The former diffused, and no brighter or whiter than the general disk; the latter sharp and quite W_1 if not W_2 as to whiteness, and very distinctly brighter than the general disk.

The seas appeared a natural grey, the *Sinus Sabæus* being the darkest. In the region to the S. the contrasts are much less marked, the grey spots are lighter, the bright spots duller than

near the equator. It is, therefore, a matter of difficulty to separate one from the other.

Def. fair, but inferior to what it was on August 30.

September 5.—Two sketches made, 13^h 49^m and 14^h 20^m. Power 360. Def. very bad at midnight, but improving later, though only poor at the best.

Polar cap very small, smaller than drawn, difficult to see, not very bright. *Hellas* showed its northern coast line = W_1 or W_2 ; the brightest part of the planet after the polar cap or limb. Terminator better defined than on August 31, but still not so bright or well defined as the limb.

A faint diffused marking was noted in the centre of *Hellas*, possibly a trace of a canal. Beer Continent was ruddy. One canal was seen in it, Typhon? Several faint diffused patches were seen in the De La Rue Ocean, but they were too faint and diffused to locate or draw.

The *Hammonis Cornu* was again suspected, but not drawn. So the *Lacus Maris* likewise was suspected, but not drawn.

September 26.—Def. very bad. Image boiling furiously. The planet very bright, but merely a great yellow flaring naphtha lamp. The seas were the faintest possible markings, but so far as anything could be made out at all, Hussey's and Keeler's drawings of the region of the Terby Sea in 1892 was confirmed.

It was utterly unlike anything I had ever seen in this region before. It was hopeless to attempt a sketch, the image being so diffused and unsteady.

November 5.—Observed from 10^h 30^m to 13^h 30^m. Def. bad, light vapour continually passing over the planet. No markings were seen on the planet; it was just a ruddy blur. A fair set of measures of both *Deimos* and *Phobos* were, however, secured.

October 25.—In a brief note on Mars for this date it is recorded that the planet showed no markings whatever.

General Notes by Members of the Section.

The preceding reports are given in full. The following notes are derived from the reports or drawings of the remaining observers, and refer principally to points not touched upon in the general summary. In some cases also matters referred to in the summary are here treated at slightly greater length.

The following Members contributed drawings or reports or both:—

Capt. W. Noble, F.R.A.S., the Revs. Jas. Baikie, F.R.A.S., P. H. Kempthorne, F.R.A.S., Beamish Saul, and W. R. Waugh, F.R.A.S.; Drs. Gordon Paterson and D. Smart, F.R.A.S.; and Messrs. G. L. Brown, Bernard Cammell, F.R.A.S., G. T. Davis, Henry Ellis, A. Henderson, Willoughby Meares, Arthur Mee, F.R.A.S., C. Roberts, F.R.A.S., and C. A. Taylor, F.R.A.S.

OBSERVATIONS BY A. HENDERSON.

At times the details were so blurred and covered with numerous white patches, as to force me to the belief of extensive areas of Martian cloud. No maps or drawings were consulted until all the drawings had been made. The longitudes of the central meridian were then computed, and the aid of Schiaparelli's maps called in, to identify as far as possible the various workings. A very pale neutral tint cap was frequently used with great success to reduce the glare of the planet. July 29, $14^h 20^m$, $\lambda = 301^\circ$. Def. fair, p. 150-210. S. polar cap smaller and less conspicuous than when last seen (July 11, 15^h , when it was the only prominent feature, being extremely large and bright). *Hellas* very bright, especially just E. of central meridian, and when it borders the *Hadriaticum Mare*, a bright marking W. of this to limb very diffuse and not so bright as *Hellas*. *Sinus Sabæus* traced to limb as a diffuse greyish marking, and darkest just in E. limb, when it is faintly mottled. *Ausonia* in W. limb appears as a very bright patch, much fainter, and diffused into neighbouring sea. *Libya* and *Aeria* very bright. *Nilosyrtis* rather faint. *Hadriaticum Mare* darkly mottled. August 22, $13^h 20^m$, $\lambda = 58^\circ$. Def. poor, p. 150-415. S. polar cap very brilliant. *Icaria* in S.E. limb ill-defined, more like a convex brightening of the limb. *Argyre* dull, an ill-defined oval spot. *Thaumasia* bright and conspicuous, boldly out-lined, especially near *Aoniæ Sinus*. *Protei R.* suspected. *Chryse* very faint, best seen with high power. *Aromatum Prom.* the best defined and brightest portion of *Chryse*. *Margaritifer Sinus* greyish tint. *Deucalionis R.* and *Pyrhæ R.*, bright and conspicuous. *Noachis* very bright in terminator, fainter towards central meridian. September 4, $13^h 55^m$, $\lambda = 305^\circ$, Def. unsteady, p. 210 to 415, drawing made. S. polar cap small but intense. *Hellas* extremely bright. *Deucalionis R.* in E. limb bright and prominent. *Aeria* reddish in tint. *Libya* and *Ausonia* not very bright. *Syrtis Major* dark grey. *Tyrrhenum Mare* faint ill-defined spot. *Mare Australe* faint, greyish tint. September 8, 14^h , $\lambda = 270^\circ$, def. sharp, p. 210 to 415. S. polar cap very small but intense. In S. hemisphere a bright zone extending from proximity of *Promethei Sinus* to S. confines of *Aeria*, where it widens out brightest just E. and W. of C. M. The *Mare Australe* thrown into contact by this band (Martian Cloud). *Libya*; with high power. *Lacus Maris* seen with *Nepenthes* canal; difficult object, ill defined. *Isidis R.* extremely bright N. of *Nepenthes*. *Syrtis Minor* conspicuous and dark. *Eridania* very bright in terminator with p. 415. Suspected to be serrated. Has this been independently observed? September 10, $13^h 25^m$, $\lambda = 243^\circ$. Def. good, p. 210 to 415. S. polar cap very difficult. The bright stripe in S. hemisphere has partially cleared. S.E. side of *Hellas* very bright. *Aeria* brightest in wedge, confused in S. *Syrtis Minor* very dark and greenish grey in tint. September 12, $12^h 35^m$, $\lambda = 212^\circ$. Def. poor, p. 225. S. polar cap only suspected. Details very indistinct, the broad stripe across S. hemisphere broadest and brightest in about long. 182° . *Syrtis Minor* the darkest and sharpest feature in disk. Just S. *Hadriaticum Mare*

darkly mottled. September 16, $12^h 12^m$, $\lambda = 170^\circ$.—Def. poor, p. 210 to 262. S. polar cap very small. *Thyle* and *Mare Chromium* visible. *Mare Sirenum* and *Mare Cimmerium* fairly dark; faint and diffused into *Icaria* and *Phætontis*. *Zephyria* very bright in its S. edge near C. M. In best moments of def. canal *Titan* seen. September 27, $12^h 40^m$, $\lambda = 78^\circ$.—Def. bad, p. 150 to 262. S. polar cap very small, faint dark shading encircling it. *Aonius Sinus* faint and sharp. *Icaria* bright but diffuse. *Phasis* only seen in best moments of definition. *Deucalionis R.* conspicuous. S. of this the W. limb is bordered by indefinite white patches. September 28, $12^h 50^m$, $\lambda = 71^\circ$.—Def. poor, p. 150 to 262. S. polar cap only suspected. White patch still in S. hemisphere. *Pyrrhæ R.* bright. *Protei R.* as faint light spot. September 29, $12^h 30^m$, $\lambda = 58^\circ$.—Def. good, p. 210 to 415. S. polar cap vivid and very large, faint dark zone surrounding it. The stripe in S. hemisphere narrower. *Icaria* bright to limb. Portion of *Phasis* visible. A bright spur between the *Sinus* and *Thaumasias* clear from surrounding light marking, divided by narrow sharp line from *Thaumasias*, which was bright in S. edge. *Aurora Sinus* distinct, bordered brightly by *Aurea Cherso* (?). *Protei R.*, *Pyrrhæ R.*, seen as one. *Deucalionis R.* dull and towards W. limb, brightest at E. edge. *Argyre* and *Ogygis R.* very faint. October 1, $12^h 25^m$, $\lambda = 38^\circ$.—Def. good, p. 150 to 262. S. polar cap very bright, seeming to project beyond limb; no dark encircling zone. Bright S. patch duller, and broken with shading. *Aonius Sinus* narrow. *Thaumasias* and *Icaria* bright on W. edges. *Aurora Sinus* small and dark. *Margaritifera Sinus* has a dark spot joined by a faint connexion with *Aurora Sinus*, see Obs., September 29. *Protei R.* rather dull. *Deucalionis R.* very bright at limb. *Noachis* vague. *Argyre* and *Ogygis R.* faint.

BERNARD E. CAMMELL, F.R.A.S., supplies the following additional notes:—

S. polar cap, August 26, surrounded by narrow dark zone, wider on the p. side; August 29–30, observation repeated; August 31, September 5, 26, getting smaller; October 7, very faint; October 15, very indistinct if seen at all. *Syrtis Major*, August 29, apparently connected with S. pole by a dark sea; August 30, greyish blue in colour; September 5, blue grey; *Mæris Lacus* seen as a faint spot, joined to *Syrtis* by a faint shading; October 7, well-defined, beautiful blue grey. *Syrtis Minor*, September 5, well seen, blue-grey in colour; October 15, large and dark, with *Amenthes* leading out almost due N. *Solis Lacus*, September 26, very dark, joined to *Mare Erythræum* by a faint shading near the preceding end of *Thaumasias* and elongated in the E. to W. direction; September 27, observations repeated.

The Rev. J. BAIKIE, F.R.A.S.—September 12, 11^h — $11^h 30^m$, $\lambda = 193^\circ$.—A bright patch where *Atlantis I.* joins *Zephyria*. September 14, $10^h 45^m$ — $11^h 15^m$, $\lambda = 167^\circ$.—S. polar cap small. *Mare Sirenum*, a bright patch s. p. end *Dædalia*. September 26, $10^h 30^m$ — 11^h , $\lambda = 55^\circ$. Definition good. *Pyrrhæ R.* and *Protei R.* bright, *Deucalionis R.* passing off disk. S. polar cap very small. October 8, 9^h — $9^h 50^m$, $\lambda = 287^\circ$.—

Syrtis Major with small dark bay on p. side, extending in direction of *Lacus Mæris*. *Hellas* divided by a faint shading, probably *Alpheus Canal*. October 10, $9^h 30^m - 10^h$, $\lambda = 276^\circ$.—*Syrtis Minor* dark, *Syrtis Major* with same dark bay on p. side. *Ausonia, Hellas*. October 11. $9^h 30^m - 10^m$, $\lambda = 267^\circ$.—*Syrtis Minor* large, with *Lethes* projecting northwards some distance. *Syrtis Major* with same dark bay on p. side. The dark markings in the planet, as a rule, were of a slaty greenish grey. A map was never consulted before going to telescope. October 2, $8^h - 9^h 20^m$. The regions between long. $320^\circ - 20^\circ$.—The most prominent part here was the bright line of coast on the S. of *Edom*, which appeared broken up into a number of small bays. The high lights had a beaded appearance. A faint long patch between *Edom* and *Deucalionis Regio*, the latter being larger and brighter. The shading was very delicate at its extremities, the outline being very hard to distinguish. The whole of these regions had a beautiful streaky appearance, in colour cool and shaded ivory. October 8, $9^h 5^m - 10^h 50^m$, long. $220^\circ - 320^\circ$.—*Hellas* when definition was good appeared divided into three parts. The division of *Hellas* (*Alpheus* probably) several times glimpsed. N. of it several faint patches of light. Similar markings seen near *Hammonis Cornu*. On one occasion this cape appeared detached from the mainland. November 22, $7^h - 8^h 8^m$.—Definition very fine. The long island of *Cimmeria* and *Hesperia* well defined. The latter seemed to join the mainland, but was narrower here than Schiaparelli draws it. *Elysium* seen. When definition was extra good small angular patches of shade were seen on the continents. November 26, $10^h 20^m - 11^h 5^m$.—Air steady. Detail well seen. The fine surface marking seen on the 21st October and 22nd November on *Zephyria* and *Aeolis*, not seen on this occasion. It had then appeared as an extremely delicate and faint irregular network of lines, principally on *Memnonia* and *Zephyria*, and was very difficult to sketch.

These observations have shown us in a very conclusive manner the correctness of Schiaparelli's maps. Eighteen canals were seen altogether. Unfavourable weather prevented me from seeing several interesting parts of the planet, especially the *Solis Lacus* region.

G. T. DAVIS.—September 26 and 28, *Argyre, Noachis* and *Deucalionis Regio* seen, October 2, definition very good; polar cap barely visible at $9^h 50^m$; it seems to lie towards $\pm \lambda = 60^\circ$; *Hellas* white and bright on terminator; *Deucalionis, Pyrrhæ R.* and *Argyre* all very well seen—like an engraving.

In observations later than October, *Hellas* always appeared ruddy. The rosy red tint of the most conspicuous continental regions was not so apparent after the end of November. Mr. Davis considers that it was a favourable opposition for small apertures.

THE REV. P. H. KEMPTHORNE, F.R.A.S.—September 26th. $10^h 30^m$ $\lambda = 55^\circ$. *Jamuna, Ganges* seen; *Solis Lacus* faint; light streak above *Thaumasia*; *Lunæ Lacus*; part of *Uranius* seen; *Aonius Sinus* invisible. September 28th. $11^h 30^m$ $\lambda = 52^\circ$.

Lacus Tithonius with *Agathodæmon* canal. *Solis Lacus* small and dark. *Nectar*. Dark sea above *Thaumasia*. *Protei Regio* light, *Deucalionis R.* dull. *Lacus Niliacus*, *Lunæ Lacus*. October 14th $\lambda = 265$. Visible *Syrtis Minor* dark, with part of *Lethes*. Bright patch on *Cassini Land* and *Eridania*. October 16th. $\lambda = 250$. Polar cap just distinguishable. Not a trace of *Mare Hadriaticum*. *Syrtis Minor* dark with *Lethes*. *Mare Cimmerium* has vanished all but a fragment at the f. end. *Æthiops* and *Cassini Land* very bright. October 22nd 9^h 15^m $\lambda = 167^\circ$. Markings in disk very faint. *Mare Cimmerium* invisible. Dark patch below S. pole.

ARTHUR MEE, F.R.A.S.—In observations of September 6, 10, 12, 13, 14, and 18, the S. polar cap is not noted; September 19, very small and bright; trace of shading on each side September 26, bright; October 2, 7, and 8, visible; October 12, very faint; not seen subsequently. *Deucalionis R.* was ill defined on October 2; whitish October 7, *Xisuthri R.* suspected October 7. *Aeria*, when on limb, September 6, was very bright; reddish on October 7, and unlike the maps in shape; reddish, October 8.

CAPTAIN W. NOBLE, F.R.A.S.—October 15, 10^h 45^m $\lambda = 252^\circ$. *Syrtis Minor* large with the *Lethes* branching due north from it; detail much fainter and less well defined towards the eastern limb than towards the western or on the centre of the disk, November 26. Captain Noble remarks “during the present opposition it has “always seemed to me that detail has been hazier and less distinct “towards the following limb of the planet.”

DR. GORDON PATERSON.—October 7, 9^h 30^m, $\lambda = 303$.—*Aeria* deep orange colour, with the *Typhon* and *Orontes* canals visible. A large circle of light surrounding S. polar cap. October 12, 10^h, $\lambda = 266^\circ$.—*Syrtis Minor* small, *Lethes* not seen. S. polar cap well seen. October 14, 10^h 15^m, $\lambda = 252^\circ$.—*Syrtis Minor* rather small, *Lethes* not visible. *Syrtis Major* rather narrow, f. edge of *Libya* bright. October 15, 9^h 15^m, $\lambda = 244^\circ$.—Def. fluttering. *Hesperia* and *Eridania* large and bright. *Tyrrhenum Mare* dark; *Syrtis Minor* small. Same bright streak on f. edge of *Libya* as on 14th instant. October 21, 9^h 30^m, $\lambda = 180^\circ$.—*Mare Sirenum* very faint, with the faintest suspicion of *Titanum Sinus*. S. polar cap invisible.

C. ROBERTS, F.R.A.S., reports :—*Deucalionis Regio*, August 30, one of the brightest parts of the whole disk; September 1, very bright, extends over *Indus*. *Iapygia* and *Argyre*, September 5, bright. *Ausonia*, September 6, 8, and 11, bright spot. *Bright spots*, September 6, on either side of S. end of *Euphrates*; September 9 and 11, on *Phætonis* at S. end of *Atlantis I.* *Solis Lacus*, Sept. 27, the dark spot in the corner of this lake is in almost exactly the same position as one on a drawing by Prof. Schæberle at Lick, September 1, 1894; also the canal from it northwards. The region to the N. of the lake between *Ganges* and *Sirenum* very like, on September 28, the drawings of Mr. Lowell, at Flagstaff this opposition, but quite unlike Schiaparelli's map. *Indus*, September 27, very dark and continued

into the *Mare Erythræum*. Twenty-two drawings were made. Altogether, 35 canals were seen, of which 22 were well seen; 10 only part was seen; three were glimpsed; one canal, the *Jamuna*, was seen double. A map was never used for comparison while drawing at this telescope. When def. was good; the outlines of the markings always appeared very hard and sharply defined.

The Rev. BEAMISH SAUL.—August 27, 2^h, $\lambda = 30^\circ$. 6 $\frac{1}{4}$ reflector.—*Auroræ Sinus* shown well defined, with the *Jamuna* leading out of it. A line of broad shading crosses the *Jamuna* from S.E. to N.W., probably *Lacus Niliacus* and *Lunæ Lacus*. Faint shading round S. polar cap, which is large. October 2, 10^h 30^m, $\lambda = 1^\circ$. 10-in. reflector.—Shows the two forks of *Fastigium Aryn*, the p. one very small. The f. one much larger, with the commencement of *Gehon* leading out of it. *Deucalionis R.* visible, but not joined to *Thymiamata*. S. polar cap, with faint shading round, especially noticeable on p. edge. October 7, 9^h 30^m, $\lambda = 301^\circ$.—*Syrtis Minor* faint. *Sabæus Sinus*, with a glimpse of *Fastigium Aryn*. Trace of *Xisuthri R.* Part of *Deucalionis R.* S. polar cap well seen, with trace of shading round. October 12, 10^h 30^m, $\lambda = 263^\circ$. 8 $\frac{1}{2}$ reflector.—S. polar cap a mere speck. *Syrtis Minor* rather small. *Chromium Mare* rather dark, and *Xisuthri B.* The following part of the planet was very ill-defined, November 10–20.

DR. D. SMART, F.R.A.S.—October 16, $\lambda = 240$. Drawing shows unmistakably the peculiar aspect of the planet at this time. *Syrtis Minor* was drawn large, and extending some distance north, which extension is evidently the *Lethes*? (*Amenthes*) canal. The *Mare Cimmerium* is quite blotted out. Dr. Smart reports that he was much puzzled with the aspect of the planet at the time, and that he noticed during the latter part of October an almost total absence of markings, also that the S. polar cap was invisible. The weather, especially towards the end of the Autumn, was very unfavourable.

REV. W. R. WAUGH, F.R.A.S.—September 19, 10^h. S. polar cap seen; a very bright patch to N.E. of cap as if cloud. Limb of planet all round unusually bright. October 13, 9^h 30^m. Three irregular white markings in the southern portion of the disk which could not be identified. November 19, 9^h. Two bright spots glimpsed on the terminator. December 18, 5^h. Two bright spots on terminator plainly seen.

Note by Director.—This drawing shows the *Kaiser Sea* very well with a small bay extending into *Aeria* on the f side of the *Kaiser Sea*, at a point where the *Typhon* debouches. A similar bay was shown in a drawing by J. T. Wood on October 14.

January 1, 8^h. The two bright spots on the terminator were again seen during the evening. The southern one somewhat elongated.

J. T. WOOD. The colour of the continents was a decided pink, the dark markings a blue-black or blue-grey in colour; the colours seen well with reflector but not with refractor.

October 1, 11^h, $\lambda = 19^\circ$. Moments of splendid definition phase just perceptible, S. polar cap bright. October 14, 10^h, $\lambda = 252^\circ$. Seeing good. S. polar cap not seen or very doubtful. Of the *Mare Cimmerium* on p. edge of disk, there does not appear any trace. On f. side of *Syrtis Major*, there is shown a very dark bay extending into *Aeria* at a point where the *Typhon* canal debouches. (See note by Director above.)

XX

The COUNCIL of the Association regret the great delay which has taken place in the publication of the present report. The discussion and collation of the drawings and reports on the planet Mars must always be a laborious task, and proved a specially heavy one in the present instance. Mr. Cammell, the Director, prepared a report with great industry and care, but it proved to be too voluminous for the Council to undertake to publish in the form in which it was presented to them. Unfortunately Mr. Cammell was unable to spare the time necessary for a recasting of the materials in his hands, and the report was necessarily laid on one side, until Mr. N. E. Green, with his usual devotion to the interests of the Association, undertook the task of giving it its present form.

The Council feels that the Association owes a very great debt to Mr. Green for undertaking so heavy a work, especially as he was already Director of an important Section, and for the skill and promptness with which he has brought it to a successful conclusion.

Mr. Green has altered the Report, which Mr. Cammell, the Director of the Section, had prepared, as little as was consistent with the imperative necessity of curtailing it very considerably.

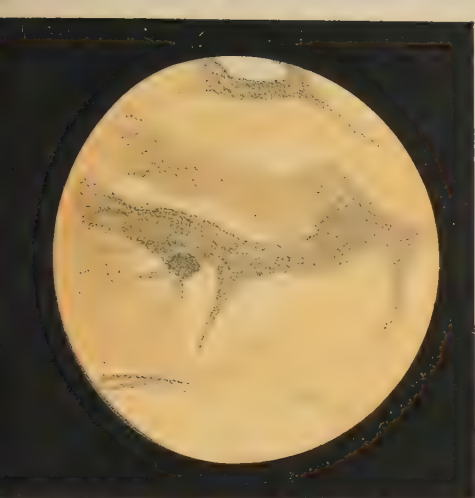


Fig. 1. C. Roberts 6 $\frac{1}{2}$ " Spec :
Sep 1 16^h 5^m Long 5°



Fig. 2. J Wood 3 $\frac{1}{2}$ " O G Power 200
Sep 1 11^h Long 19°



Fig. 3. W R Waugh 12 $\frac{1}{2}$ " Spec Power 200
Sep. 29 12^h Long 50°

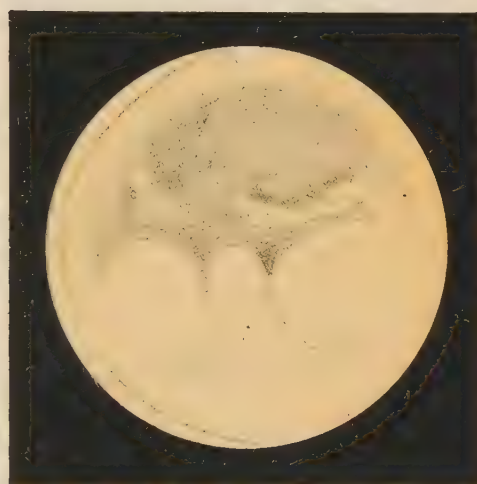


Fig. 4. H Kempinorile 5 $\frac{1}{2}$ " Spec
Sep 16 10^h 30^m Long 15°



Fig. 5. B Cammell 12 $\frac{1}{2}$ " Spec Power 200



Fig. 6. W Antoniad 9 $\frac{1}{2}$ " O G Power 200

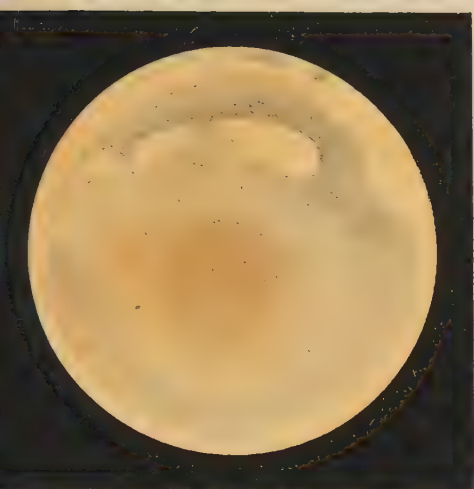


Fig. 7 Arthur Meade's Spec Power 400
Sep 13th 1871 Long 135°

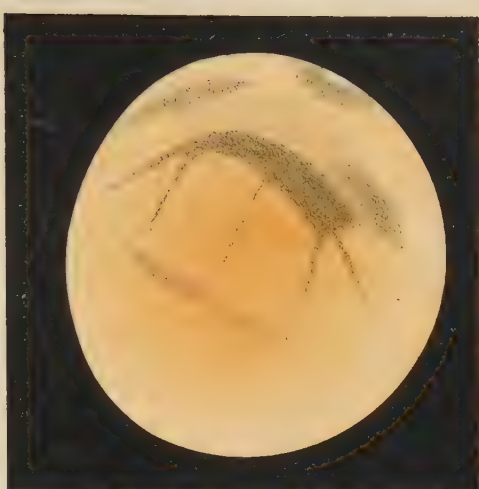


Fig. 8 E. M. Antoniadi, 9 $\frac{1}{2}$ " O. G. Power 220.
Sep 15 10^h 21^m Long 153°.



Fig. 9 Henderson, 10 $\frac{1}{2}$ " Spec Power 200 &
Sep 16 1871 Long 170°

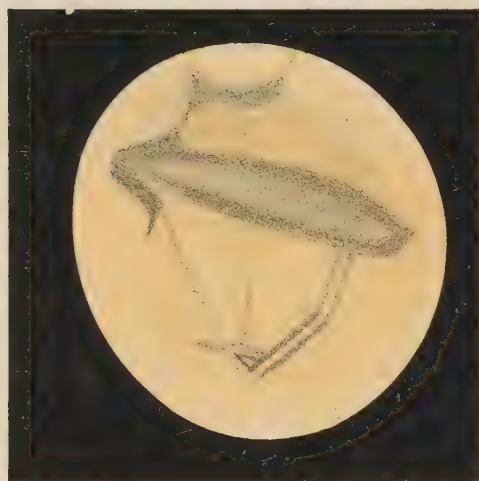


Fig. 10 A. S. Williams 6 $\frac{1}{2}$ " Spec Power 225.
Sep 19 15^h 40^m Long 194°



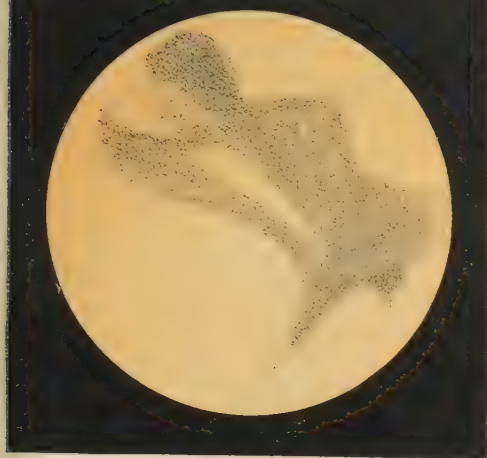


Fig. 13. J. T. Wood $3\frac{1}{2}''$ O.G. Power 200
Oct 14. 10^h Long. 252°

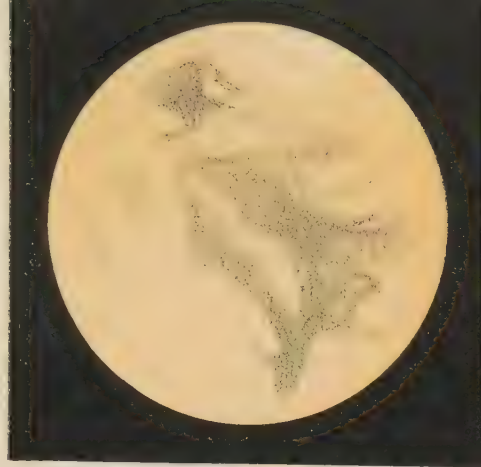


Fig. 14. G. L. Brown 10 $\frac{1}{2}''$ Spec. Power 173
Oct 11 9^h 25^m Long. 266°

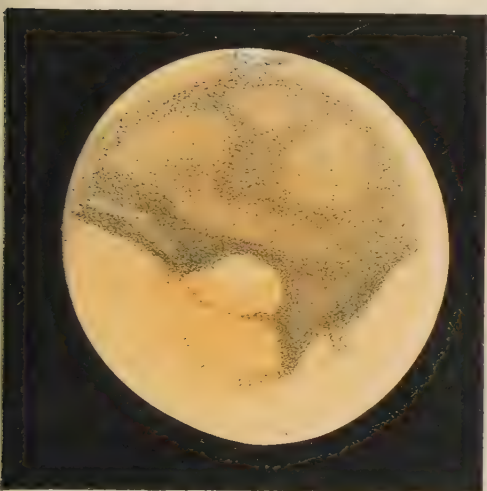


Fig. 15. B. Cammell 12 $\frac{1}{2}''$ Spec. Power 250
Sep 5 12^h 30^m Long. 276°



Fig. 16. E. M. Antoniadis 9 $\frac{1}{2}''$ O.G. Power 220
Sep. 7 13^h 51^m Long. 277°

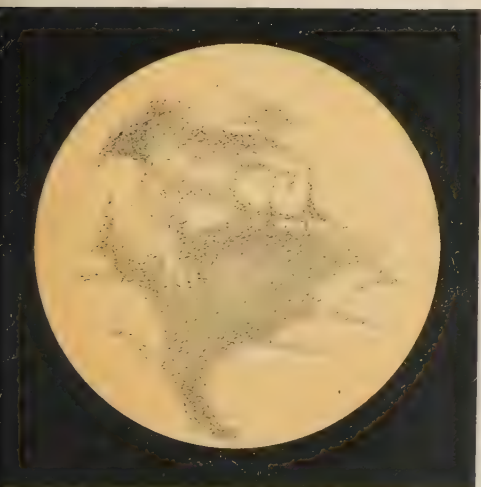


Fig. 17. G. L. Brown 10 $\frac{1}{2}''$ Spec. Power 73.
Oct 9 10^h 40^m Long. 258°

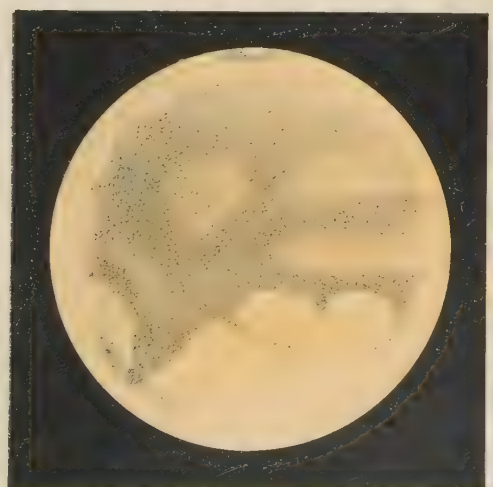


Fig. 18. B. Cammell 12 $\frac{1}{2}''$ Spec. Power 250
Oct 11 10^h 40^m Long. 258°

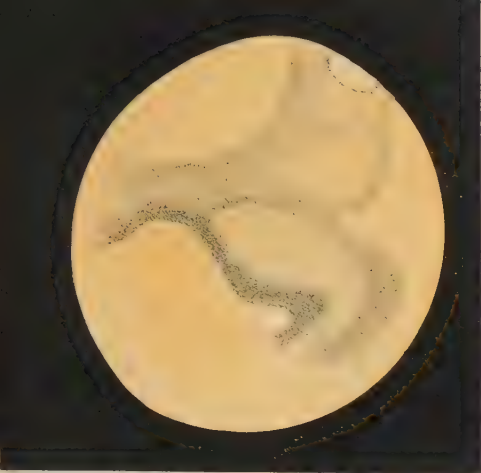


Fig. 5. E. V. Maxrder 28th O.G. Power 500.
Sep 11th 32nd m Long 328°

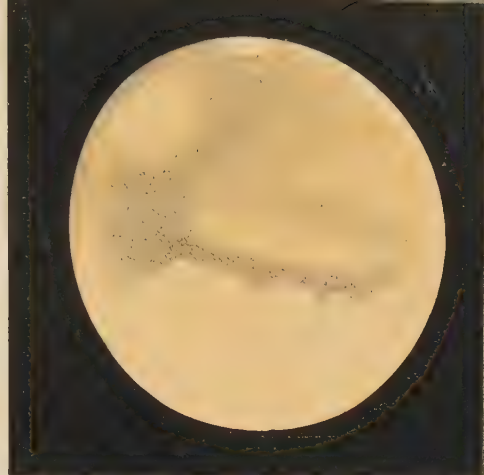


Fig. 6. E. Jammell 13th O.G. Power 750
Aug 23rd 40th m Long 329°

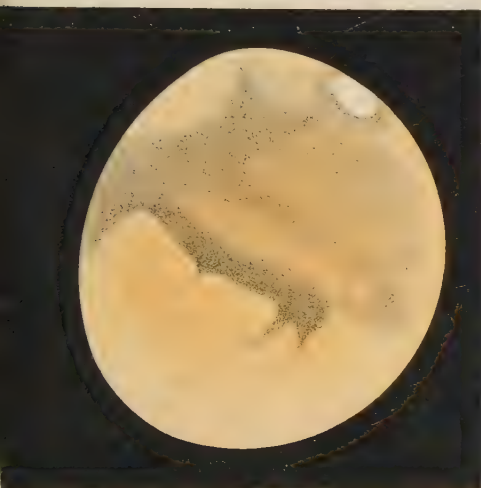


Fig. 21. E. M. Antoniadi 91st O.G. Power 220.
Aug 28th 50th m Long 341°

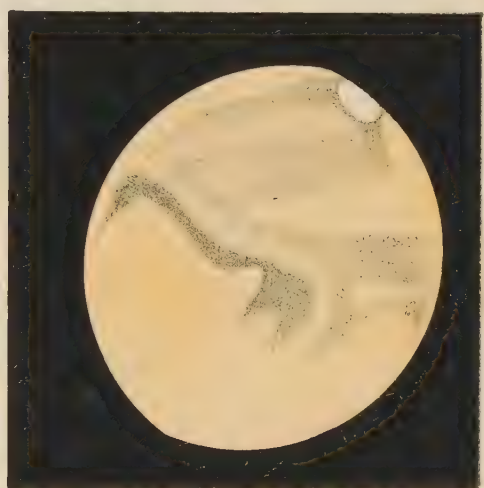
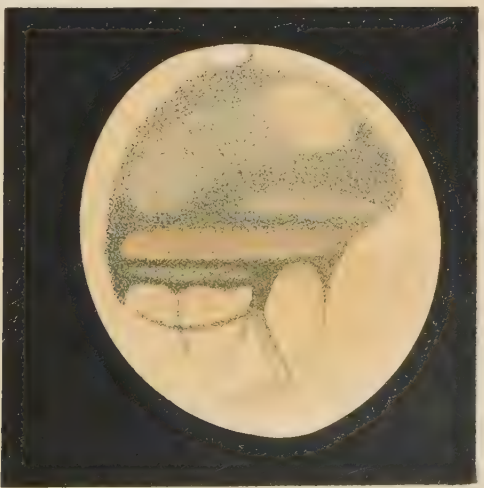
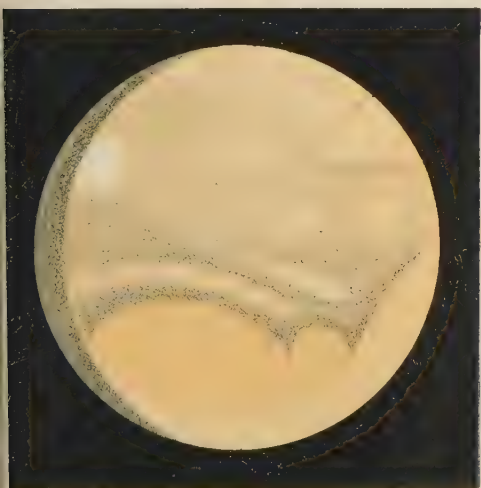


Fig. 22. F. W. Maunder 28th O.G. Power 500.
Aug 30th 40th m Long 348°



Memoirs
OF THE
British Astronomical Association.

EDITED BY
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SECTION FOR THE OBSERVATION OF METEORS.

DIRECTOR,—HENRY CORDER.

REPORT OF THE SECTION.

Introductory.

The past year has been much more favourable to meteor observers than 1894, for although perhaps none of the chief showers were quite unobscured by cloud, yet some of the best nights of each were clear in different parts of the country, and the mildness of the season made observing easy all through the autumn.

A rather more detailed description has been given in this report of some of the minor showers, and where possible, remarks have been made on their non-appearance, as it is only by so doing that we shall be able to decide which showers return annually as the Perseids, or only at long intervals as the Leonids.

The Director has again to thank Mr. Denning for his kind help in sending a list of doubly observed meteors, but it is with great regret that we note his retirement from the Association. One or two other Members have resigned, and not many new Members have contributed much to the Section. The names of the working Members will be found with their observations, and in heartily thanking them for their co-operation, the Director also asks for their help again in 1896.

HENRY CORDER,
Director.

Meteor Showers in 1895.

QUADRANTIDS OF JANUARY 1-3 1895.

The best observations of this fugitive shower were obtained by Mr. Backhouse at Sunderland, chiefly in the morning hours of January 2nd and 3rd. The first were seen at the end of December, and a few were recorded by the Director on January 4th. Mr. Backhouse considers that the maximum probably took place January 2nd 1^h 0^m, as meteors were about equally plentiful on the morning and evening of that day. About 20 Quadrantids were seen from Sunderland, of which three were as bright as Sirius. The paths of six of these meet at a point in Hercules ($236^{\circ} + 46^{\circ}$), from which a number of the finest meteors have been seen in former years, so as to make it appear almost as a separate shower. About an equal number came from points in Quadrans at $240^{\circ} + 58^{\circ}$ and $227^{\circ} + 59^{\circ}$. It does not seem that many were seen elsewhere. Mr. Denning saw a small meteor at 6^h 43^m January 1st from Bristol, which was also seen from Bridgwater, and the radiant at $233^{\circ} + 56^{\circ}$ is considerably N. of the usual point. From a few paths mapped at Bridgwater the centre was found to be at $239^{\circ} + 48^{\circ}$, so that the observations of the different Members of the Section do not support each other.

Mr. Milligan at Belfast saw none on January 1st, but about a dozen on January 2nd.

A beautiful orange Eridanid from near γ in that constellation, seen by the southern observers, is described elsewhere. Besides this shower Mr. Backhouse and Prof. A. S. Herschel observed some long interesting meteors from near ϵ Virginis at $200^{\circ} + 12^{\circ}$ chiefly on January 23rd—25th, one being a white one as bright as Venus, but without any streak, and there were weaker showers in Leo and Virgo. Another certain shower was seen from near κ Ursæ Majoris, eight meteors recorded by different observers radiating from about $140^{\circ} + 49^{\circ}$.

It is always interesting to keep records of slow orange meteors from the southern and western sky, as some very long continued showers may in time be made out. This winter meteors appeared again from near β Tauri, and there appeared to be another area of radiation in Perseus, at about $62^{\circ} + 34^{\circ}$.

FEBRUARY.

The intense cold of this month, and the usual scarcity of meteors, made watching unpleasant. Some attempt was made, however, but almost nothing seen. Some bright meteors seemed to show a radiant in Camelus at about $70^{\circ} + 73^{\circ}$.

MARCH, 1895.

During the total lunar eclipse of March 10th several fine meteors were seen, and descriptions will be found in another portion of this report. Several combined watches were attempted, but no great results were obtained. Mr. Blakeley at Dewsbury was the most successful. In all he saw 26 meteors in about 6 hours on different dates; and almost the same number were seen by the Director also with an hourly number of about four only. Mr. Townshend and Mr. Blakeley found the chief radiant to be at

$175^{\circ} + 10^{\circ}$ near β Leonis, giving slow meteors. It was active also last year. There were also radiants in Draco, and other meteors came from Virgo, Mr. Denning finding a radiant near Spica at $204^{\circ} - 10^{\circ}$ for two meteors on March 24th, a few others being recorded at Bridgwater from this constellation, and in April by Mr. Blakeley, five were seen from $199^{\circ} - 9^{\circ}$.

APRIL, 1895.

This month also proved disappointing, for cloudy weather was very prevalent at the time of the Lyrids, and at other times meteors were very scarce.

The most important minor shower is from Serpens and Libra. To what extent the different radiants are physically connected we do not know, but it seems as if we had here one of the old broken up showers. This year the most distinct centre was at $225^{\circ} - 2^{\circ}$, from which nine meteors were seen by the Director, and a few more from neighbouring points. This does not at all agree with the observations of the last two years, though the system will be found in Mr. Denning's catalogue for earlier years. The Coronids are a long enduring shower, unless that seen in May is distinct from that of the early spring, which is rather nearer the head of Serpens, at about $240^{\circ} + 24^{\circ}$. Another shower is situated near ϵ Virginis at about $200^{\circ} + 9^{\circ}$ close to the position found in January, and it is very probably a continuation of that shower. Mention was made of the slow meteors from β Tauri, several seen in March and April from $85^{\circ} + 30^{\circ}$ pretty certainly prolong this shower from the end of December.

The Lyrids were best observed by Mr. Blakeley, and also by the Director, and meteors seemed to come from this shower from April 13 to April 24. The 20th was quite overcast, but a fair number were seen on the 19th and 21st, the highest hourly rate of Lyrids being six on the 21st.

The radiants found are very discordant, but those seen on the maps made by Mr. Blakeley are so distinct that it seems almost impossible to doubt their accuracy as far as his observations are concerned. On the 19th, the radiant is clearly defined near θ Herculis, $269^{\circ} + 37^{\circ}$, with nine meteors; on the 21st, it had moved to $274^{\circ} + 36^{\circ}$, with eight meteors, and on the 23rd, to $280^{\circ} + 35^{\circ}$, with four meteors, forming a very regular progressive series. But it will be seen from the report for 1893 that both the first radiants were active at once in that year, though Mr. Denning saw nothing of the Herculids. This year, at the time when Mr. Blakeley sees only Herculids, Mr. Denning and the Director see nothing but Lyrids. Unfortunately we are not helped much by double observations. One meteor on the 19th was indeed recorded by four observers, but owing to cloud the paths were not well observed, and the radiant at $269^{\circ} + 30^{\circ}$ is not very satisfactory. A bright meteor seen by Messrs. Denning and Corder at $11^h 46^m$, and claimed by both as supporting their radiant, turned out to be a Sagittid from $300^{\circ} + 20^{\circ}$.

Mr. Milligan, from three meteors on the 21st, estimated the radiant to be at $275^{\circ} + 32^{\circ}$; Mr. Pope, at Dingwall, and Mr. Townshend, at Leeds, saw a few more, and Mr. Backhouse gives the following table, but only two of the meteors seen by him were liquids.

Time.	O.	Sky.	O'.	Hindrance.	Mag. vis.	F.	R.	L.
4 mo. 19: h m h m								
11.7 to 11.17	10	'9	9	Thin cloud	6½-6	0	0	—
11.48 „ 12.0	11	'9	9'9	„	6½-6	0	0	—
12.22 „ 12.38	8	'7	5'6	„	6½-6½	0	0	—
12.43 „ 12.49	6	'8	4'8	—	—	0	4'1	—
13.5 „ 13.19	9	'9	8'1	—	—	1		1
13.39 „ 13.53	14	1'	14	—	—	2		1
14.3 „ 14.17	14	1'	14	—	—	0		—
14.20 „ 14.30	5	'6	3	—	—	0		—
Total	77	—	68	—	—	3	2'6	2
4 mo. 20:								
10.11 to 10.34	8	'8	6'4	Thin cloud	6	0	0	—
10.35 „ 10.48	6	'7	4'2	„	6	0	0	—
Total	14	—	11	—	—	0	0	—
Grand Total	91	—	79	—	—	3	2'3	2

A few brilliant Lyrids were seen on the 19th, the chief ones being at 10^h 58^m, $2 \times \mathcal{U}$ with a bright streak (Blakeley, &c.); at 13^h 51^m = \mathcal{U} nearly white, with a bright streak, about 15° in length (Backhouse); and another at 14^h 47^m = \mathcal{U} , of a greenish colour, leaving a beautiful streak for five minutes, which gradually became shaped like a hook, and finally a right angle in the upper part of Lyra, having moved somewhat, and expanded to about four times the length it had at first (Corder).

A few small meteors were seen to radiate from 278 + 43 in Lyra as late as May.

MAY 1895.

Watch was kept for the Aquarid shower, in the early hours of May 2 and 6, and on each date one Aquarid was seen, radiating from 339 — 4. Other observers saw none, so that this interesting shower is still in a very feeble condition. Special watches were also arranged for Coronids and a few of these meteors were recorded by most observers with a radiant near α Coronæ, but the shower was not as strong as in 1893.

JUNE—JULY 1895.

Owing to the twilight very little meteoric work was possible in these months. There were signs of feeble showers in Vulpecula, Pisces (with very long swift meteors like the May Aquarids), and also in Cassiopeia, at 10 + 50.

AUGUST 1895.

Some of the August showers commence in July, but it is, perhaps, best to class them all as August showers, leaving the

first three weeks of July as a very barren time. By the end of the month the Aquarids generally commence, but this year they seemed scarce, not a score being recorded by different observers. Their radiant appeared to be at $340^{\circ} - 18^{\circ}$. A number of minor showers will be found in the general catalogue.

The Perseid epoch was not favoured by very good weather, and the high declination of the waning moon made observations difficult. Most Members of the Section have sent in a report, but in some cases nothing at all was seen of the shower.

A list of the radiants found is given in the general catalogue, from which it will be seen that there is good evidence of the gradual change of position from $35^{\circ} + 55^{\circ}$ on August 2 to $51^{\circ} + 56^{\circ}$ on August 18th. A more distant position at $55^{\circ} + 60^{\circ}$ on this date was most probably a distinct shower of Camelids. On most nights other centres of divergence were found by mapping, and most observers noted the radiant as anything but a "point." Of course the moonlight and frequent cloud would account for part of this scattering. From these same reasons it is not easy to form an estimate of the strength of the shower.

On August 2nd Mr. Blakeley watched from $11^h 44^m$ to $14^h 40^m$, seeing 28 meteors, of which 18 were from showers in Perseus.

On August 7th, between $9^h 45^m$ and $12^h 45^m$, only 12 meteors were seen at Bridgwater, seven being Perseids. At Dewsbury, Mr. Blakeley watched between $11^h 50^m$ and $14^h 10^m$, and saw 16 meteors, of which 12 were Perseids. On August 9th it was fine at Bridgwater, and between 11^h and 14^h , 28 meteors were counted, 23 being Perseids. The 10th was generally cloudy, with heavy thunderstorms round London. Mr. Denning saw 17 Perseids, and Prof. Herschel at Slough was favoured by a fine interval, but found meteors very scarce, so that it would not seem that any special maximum occurred on this day. August 11th was the best night generally, as it was fine, and the moon not so brilliant. Most observers recorded some Perseids, and at Bridgwater watch was kept all night, from $9^h 50^m$ until $15^h 40^m$, with some intervals, when the sky was almost overcast. In spite of clouds and moon 87 meteors were seen, of which about 70 were Perseids, with an area of radiation stretching from η Persei to B.C. Camelopardi, the strongest radiation being from $43\frac{1}{2}^{\circ} + 58^{\circ}$. Very few brilliant meteors were seen, two were equal to Jupiter, with blue or green nuclei and lasting streaks, they were at $11^h 42^m$ and $13^h 32^m$. Other observers were not much more fortunate, but Mr. Blakeley recorded one equal γ at $13^h 33^m$ on August 2nd, and another on that night at $13^h 45^m$, equal to γ with a lightning-like flash, and cloud of sparks. A few others, about equal to Sirius or Vega, were recorded, but the shower seemed weak and destitute of very brilliant meteors. Further observations were made on August 13th, 14th, and 18th, but not many Perseids were seen. During August about 260 meteors were recorded at Bridgwater, about half of which were Perseids.

After the true Perseids had passed away, some other showers were noticed in this constellation between ϵ and ζ Persei, with swift arrowy meteors, leaving narrow but lasting streaks. Another

shower with very swift meteors was situated near β Aurigæ. Mr. Blakeley was fortunate in seeing about three of the meteors from near θ Cygni ($291^\circ + 50^\circ$) which formed such a marked shower in 1893, but it is evident that this shower must be classed with the Leonids and Andromedids which have a brilliant maximum in one year, and then a long interval with very few meteors. It will be most important to watch this position, although the results may be "nil" for many years. The very similar shower of Cepheids, active at the same time, also seems to have dwindled—could they possibly have had any physical connexion? Our ignorance of the laws governing meteor showers is at present profound, and it is as well to chronicle this coincidence.

SEPTEMBER 1895.

Nearly 200 meteors were recorded at Bridgwater in this month, generally a very poor one, and nearly 30 radiants were determined. One of the most active showers radiated from $57^\circ + 58^\circ$ in Camelus, approximately the position found in August, and no doubt the same shower, the meteors being bright and swift with fine streaks. A cluster of radiants with similar meteors also extended through Auriga to β Tauri, the positions of various radiants are given in the list, but very probably some of them may be physically connected.

Another interesting group was found in Orion, the chief centre being near γ Orionis at $79^\circ + 6^\circ$. These meteors were extremely swift, the streaks often brightening after the nucleus died out.

The Polarids ($320^\circ + 88^\circ$) were quite active during the last week of the month, they were short white meteors, very rarely leaving streaks. There was also an active shower of Cassiopeids from $15^\circ + 59^\circ$. In the southern sky there were several radiants, chiefly in Aquarius and Pisces. The Aquarids, probably a continuation of the August showers. The centre of the Piscid showers was at $360^\circ + 7^\circ$, with several branch showers extending into Cetus. The α Pegasids were very feeble this year.

OCTOBER.

Several observers kept watch for the Orionids of October 15th to 18th, but the shower was not so strong as usual, Mr. Blakeley recorded about a dozen, which he believed were Orionids, but the radiant comes out several degrees W. of the usual position, and probably some belonged to other showers. At Bridgwater nine Orionids were seen, the radiant being at $91^\circ + 15^\circ$. Mr. Backhouse saw about six, but other observers were even less fortunate. The contemporaneous shower from the feet of Gemini was, however, more strongly marked, more than 30 meteors from the combined centres being seen. The several showers in Aries and Musca were not so well marked as of late years, nor were the Cetids, but as it was moonlight at the end of the month and beginning of November one can hardly judge. An interesting double shower of very swift meteors was seen at Bridgwater, lasting on into November, from southern radiants in Monoceros.

A few small meteors appeared to belong to the December Geminids.

TABLE OF ORIONIDS.

Time.	O.	Sky.	O'.	Hindrance.	Mag. vis.	F.	R.	O.
10 mo. 19: h m h m 10 to 10.45	8	*7	5'6	—	—	1	—	0
10.50 „ 11.5	7	*9	6'3	—	—	0	—	0
Total	15	—	12	—	—	1	5'0	0
10 mo. 21: h m h m 15.6 to 15.29	15	*5	7'5	—	—	2	—	1
15.45 „ 16.15	28	*9	25'2	—	—	4	—	3
16.15 „ 16.30	11	*7	7'7	—	—	1	—	1
16.39 „ 17.12	27	*8	21'6	—	—	1	—	1
Total	81	—	62	—	—	8	7'7	6
Grand Total	96	—	74	—	—	9	7'3	6

T. W. B.

NOVEMBER.

The Taurids commenced about October 23, and continued until the middle of December. The radiant was very clearly defined near A Tauri at $58^{\circ} + 22\frac{1}{2}^{\circ}$. About 40 Taurids were recorded by the Section, not many of them being bright, but they are always interesting, the colours they exhibit, orange, green, and steely blue, being a special feature. The Leonids did not return this year in any strength, but fine weather prevailed, and about 60 were recorded, several being of great brilliance, six or seven being brighter than 1st magnitude, most of these are described in the table of large meteors. The radiant was well defined at about $151^{\circ} + 23^{\circ}$. A few very distinct and curious meteors radiated from Cassiopeia, at about $34^{\circ} + 65^{\circ}$. They were slow moving, and had orange trains. A few more small Geminids were recorded by at least two observers, and as some were also seen in previous years there can be little doubt but that a radiant of short quick meteors exists in October and November near Castor and Pollux, the positions and appearance of the meteors agreeing well with those of the December shower.

Owing to moonlight not many watched for the Andromedes, and not more than two or three were seen. A few swift and unusually brilliant meteors were seen by Mr. Townshend, apparently from near Leonis, November 13th, 14th.

DECEMBER.

More than 120 Geminids were seen this season, chiefly on the 10th, 11th, and 12th, and the shower was evidently a strong one. A few meteors only exceeded 1st magnitude, and these were pale emerald green. Scarcely any left streaks. The hourly number of Geminids only, for one observer, seems to have been not less

than 20 on both December 11th and 12th, when the shower was at its best in the morning hours.

Mr. Backhouse, at Sunderland, saw 16 Geminids in 263 minutes (corrected to 237) in short watches between December 7th and 13th. The brightest meteor, equal to γ , was seen at $12^h 18^m$ on December 12th, at which time the shower seemed to him at its best. About the same time a bright meteor was also seen by Mr. Blakeley at Dewsbury. This observer saw about 30 Geminids, chiefly on December 12th, when between $11^h 10^m$ and $12^h 26^m$, 24 were counted in a stormy sky. The Rev. F. H. Foulkes, M.A., at Devonport, saw more than 50 meteors on the night of December 11th, without intending any watch for them. One fine meteor, an orange one, equal γ , was seen also at Bridgwater, and was doubtless a Taurid. The Director, at Bridgwater, saw 78 Geminids, chiefly on December 11th, and the hourly number was about 20, or 31 of all meteors between 15^h and 16^h . Prof. A. S. Herschel also kindly sent notes of the shower as seen at Slough on December 12th. He mapped 20 meteors in 40 minutes near midnight, and he considered the rate for Geminids to be about 25 per hour. The radiant was very ill defined, one might call it an area, extending for some distance between Castor, ϵ and θ Geminorum, the average of four positions being $108^\circ + 32^\circ$.

Very few of the fine slow-moving meteors from near β Tauri were seen, but conditions were not favourable. Mr. Blakeley recorded one, however, which was nearly = γ .

List of Radiant Points of Meteors, 1895.

B.A.A. Ref. No.	Date.	Name.	Radiant.	No. of ψ 's.	Class.	Ob- server.
446	1895. Jan. 1-3	Quadrantids -	$240^\circ + 58^\circ$	7	Swift	Ba.
447	" 1-3	Quadrantids -	$227 + 59$			
448	" 1-3	Quadrantids -	$239 + 48$	3		C.
449	" 1-3	Herculids -	$236 + 46$	6	Swift	Ba.
450	" 1-3	ϵ Virginis -	$200 + 12$	4	Slow	Ba.; H.
451	" 1-3	Virgo -	$175 + 10$	4	Slow	H.
452	Jan. -	θ Ursæ Maj. -	$141 + 50$	5	Quick	H.; Ba.;
453	" -	θ Ursæ Maj. -	$140 + 49$	3	Quick	&c. C.
454	" -	Perseus -	$62 + 34$	9	Slow	C.
455	Mar.-Apr. -	β Tauri -	$85 + 30$	4	Slow	C.
456	Mar. -	Ursa Maj. -	$\left\{ \begin{array}{l} 145 + 47 \\ 145 + 60 \end{array} \right.$	—	Quick	Bl.; T.
457	" -	α Draconis -	$210 + 69$	3	Slow	C.
458	" -	λ Draconis -	$170 + 69$	—	Quick	Bl.
459	" -	δ Draconis -	$280 + 67$	—	Quick	Bl.
460	" -	β Leonis -	$175 + 10$	—	Slow	Bl.; T.C.
461	April 19	Lyrids (θ Her- culis).	$269 + 37$	9	Swift	Bl.

B.A.A. Ref. No.	Date.	Name.	Radiant.	No. of ψ's.	Class.	Ob- server.
462	Apr. 21 ¹⁸⁹⁵ -	Lyrids -	274° + 30°	8	Swift - -	Bl.
463	" 23 -	Lyrids -	280 + 35	4	Swift - -	Bl.
464	" 13-27 -	Lyrids -	274 + 33	15	Swift - -	C.
465	" 13-27 -	Lyrids -	270 + 29			
466	" 13-27 -	Lyrids -	285 + 32			
467	" 13-27 -	Hercules -	268 + 45	5	Swift - -	C.
468	April - -	α Virginis -	199 - 9	5	Slow - -	Bl.
469	" - -	μ Virginis -	218 - 10	3	Slow - -	Bl.
470	" - -	μ Virginis -	225 - 2	9	Slow - -	C.
471	" - -	Virginids -	200 + 9	4	Slow - -	C.
472	" - -	Bootids -	208 + 7	3	Quick - -	Bl.
473	May 1-4 ⁹ -	Aquarids -	339 - 4	2	Swift - -	C.
474	" - -	Lyrids -	278 + 43	5	Quick - -	C.
475	" - -	ξ Draconis -	261 + 61	4	Quick - -	C.
476	" - -	ο Draconis -	284 + 60	4	Quick - -	C.
477	Apr.-May -	α Coronids -	232 + 26	8	Quick - -	C.
478	" - -	α Coronids -	234 + 29	3	Quick - -	Bl.
479	" - -	Bootids -	217 + 45	3	Quick - -	Bl.
480	June - -	Vulpecula -	303 + 23	4	Quick - -	C.
481	" - -	Piscids -	355 + 23	3	Swift - -	C.
482	" - -	Cassiopeids -	10 + 50	3	Swift - -	C.
483	July 21-29 -	Cassiopeids -	8 + 51	5	Swift - -	C.
484	July-Aug. -	Equuleus -	319 + 14	5	Quick - -	C.
485	Aug. - -	Equuleus -	318 + 6	3	Quick - -	Bl.
486	July-Aug. -	ρ Cygni -	318 + 51	5	Quick - -	C.
487	July 21-Aug.	Aquarids -	340 - 14	17	Slow - -	T.C.; Bl.; &c.
488	Aug. 2 - -	γ Pegasi -	3 + 16	—	Quick - -	Bl.
489	" 2, &c. -	Draco - -	260 + 48	6	Quick - -	T.; Bl.
490	" - -	Aquilids -	284 + 16	5	Quick - -	T.; Bl.
491	" - -	ο Cygni -	301 + 46	3	Quick - -	C.
492	" - -	δ Draconis -	288 + 65	3	Slowish - -	C.
493	" 13-22 -	η Pegasi -	339 + 28	4	Quick - -	C.
494	" 11-24 -	Capricornus -	313 - 15	4	Slow - -	C.
495	" 7-13 -	Lacerta -	333 + 36	4	Quick - -	C. & D.
496	" 18 - -	α Andromedæ -	4 + 29	5	Quick - -	C.
497	" 18-24 -	η Cephei -	310 + 63	5	Quick - -	C.
498	" 13-31 -	β Aurigæ -	85 + 41½	10	Swift - -	C.
499	" 13-31 -	μ Persei -	60 + 54	4	Swift - -	C.
500	" 18-28 -	ζ Persei -	51 + 30	3	Swift - -	C.

B.A.A. Ref. No.	Date.	Name.	Radiant.	No. of ψ 's.	Class.	Ob server.
501	1895. Aug. 18-28	ξ Persei	$54^{\circ} + 34^{\circ}$	4	Swift	C.
502	" 18	Camelids	$55 + 60$	7	Swift	C.
503	" 20-24	Camelids	$55 + 60$	4	Swift	T.
504	" 2	α - β Perseids	$36 + 46$	—	Swift	Bl.
505	" 14	Cygnids	$291 + 50$	3	Quick	Bl.
506	" 7-13	Cygnids	$292 + 52$	3	Quick	D.
507	Aug.-Sept.	λ Draconis	$175 + 73$	4	Quick	T.; Bl.
508	Aug. -	ϕ Andromedæ	$24 + 52$	7	Swift	Bl.; C.T.
509	" 2	Perseids	$35 + 55$	—	Swift	Bl.
510	" 7	Perseids	$41 + 57$	—	Swift	D.
511	" 7	Perseids	$39 + 53$	—	Swift	Bl.
512	" 7	Perseids	$40 + 56$	—	Swift	C.
513	" 9	Perseids	$43 + 57$	—	Swift	C.
514	" 10	Perseids	$45 + 55$	17	Swift	D.
515	" 11	Perseids	$44 + 58$	7	Swift	D.
516	" 11	Perseids	$45 + 56$	—	Swift	Bl.
517	" 11	Perseids	$43\frac{1}{2} + 58$	—	Swift	C.
518	" 13	Perseids	$51\frac{1}{2} + 56\frac{1}{2}$	—	Swift	C.
519	" 14	Perseids	$51 + 58$	—	Swift	Bl.
520	" 18	Perseids	$51 + 56$	—	Swift	C.
521	Aug.-Sept.	η Ceti	$11 - 12$	3	Slow	T.P.; Bl.; C.
522	Sept. 13-20	Camelids	$57 + 58$	14	Swift	C.
523	" 14-16	Aurigids	$98 + 50$	12	Swift	C.
524	" 14-26	Aurigids	$87 + 52$			
525	" 14-26	Aurigids	$106 + 55$			
526	" 17-26	β Tauri	$71 + 31$	17	Swift	C.
527	" 17-26	θ Aurigæ	$83 + 34$			
528	" 17-26	ζ Aurigæ	$72 + 38$			
529	" 26	ζ Tauri	$80 + 20$	3	Quick	C.
530	" 24-26	ϵ Ursæ	$129 + 50$	4	Quick	C.
531	" 17-24	γ Orionis	$79 + 6$	10	Swift	C.
532	" 17-24	Orion	75 ± 0			
533	" 20-26	Polarids	$320 + 88$	10	Quick	C.
534	" 13-20	Honores	$347 + 43$	5	Quick	C.
535	" 14-22	α Pegasids	$344 + 15$	4	Quick	C.
536	" 13-26	Piscids	$360 + 7$	16	Slow	C.
537	" 13-26	Piscids	$8 + 2$			
538	" 13-20	α Aquarii	$330 - 14$	4	Slow	C.
539	" 10-26	γ Cassiopeïæ	$15 + 59$	10	Quick	C.

B.A.A. Ref. No.	Date.	Name.	Radiant.	No. of ψ's.	Class.	Ob- server.
540	Oct. 16-23 - 1895.	Orionids -	82 + 13 ⁰	12	Swift - -	Bl.
541	" 16-23 -	Orionids -	91 + 15	9	Swift - -	C.
542	" 16-24 -	μ Geminorum	93 + 25	5	Swift - -	Bl.
543	" 16-24 -	μ Geminorum	91 + 23	27	Swift - -	C.
544	" 23-27 -	γ Geminorum	97 + 17 ³			
545	" 23-27 -	ξ Geminorum	98 + 11			
546	" 23-27 -	Cetids - -	47 + 4 ³	5	Slow - -	Bl.
547	" 16-27 -	α Cetids -	43 + 6	7	Slow - -	C.
548	" 16-27 -	Arietids -	43 + 17	3	Slowish - -	Bl.
549	Oct. 16-Nov.	Arietids -	41 + 20	6	Slow - -	C.
550	" 16 " -	Aries - -	32 + 17	7	Slowish - -	C.
551	" 16 " -	f Tauri -	51 + 9	3	Slowish - -	C.
552	Oct. " -	Muscids -	43 + 28	6	Slowish - -	C.
553	" " -	Muscids -	46 + 33			
554	" - -	Aurigids -	85 + 50	4	Quick - -	Bl.; T.
555	" - -	η Piscium -	21 + 13	6	Slowish - -	T.
556	" - -	η Piscium -	21 + 14	5	Slowish - -	C.
557	" - -	δ Piscium -	13 + 11	5	Slow - -	C.
558	" - -	Draco - -	236 + 43	3	" - -	T.
559	" - -	Canes Ven. -	184 + 40	4	Swift - -	T.
560	" 23 -	Canes Ven. -	199 + 39	3	Swift - -	C.
561	Oct. " -	Lacerta -	333 + 47	3	Slow - -	C.
562	" " -	Honorids -	353 + 48	3	Quick - -	C.
563	" - -	Honorids -	352 + 45	—	Quick - -	T.
564	" 23 -	Geminids -	109 + 35	6	Quick - -	C.
565	" 16-27 -	ψ Ursæ Maj. -	160 + 42	7	Swift - -	C.
566	Oct.-Nov.	β-δ Leonis -	171 + 22	9	Quick - -	C.
567	Oct. 24-Nov.	Monoceros -	111 - 4	6	Swift - -	C.
568	" " -	Monoceros -	121 - 6	9	Swift - -	C.
569	" 23 " -	Taurids -	58 + 22	5	Slow - -	C.
570	Nov.-Dec. 15	Taurids -	58 + 22 ³	21	Slow - -	C.
571	" - -	Taurids -	65 + 22	—	Slow - -	T.
572	" - -	Taurids -	59 + 22	9	Slow - -	Bl.
573	" - -	Taurids -	58 + 22	3	Slow - -	H.
574	Nov. 13-17 -	ι Cassiopeiæ -	34 + 65	6	Slow - -	C.
575	" 13-17 -	ι Cassiopeiæ -	40 + 60	2	Slow - -	T.
576	" 13-17 -	Arietids -	42 + 21	6	Slow - -	Bl.
577	" 13-17 -	α Taurids -	66 + 17	6	Slow - -	T.; Bl.; P.; C.; H.
578	" 13-17 -	Cetids - -	50 + 5	4	Slow - -	H.

B.A.A. Ref. No.	Date.	Name.	Radiant.	No. of ψ's.	Class.	Ob- server.
579	1895. Nov. 13-17.	Cetids -	$43 + 6$	} 6	Slow -	C.
580	" 13-17	o Tauri -	$48 + 9$			
581	" 13-17	Muscids -	$35 + 27$	—	Slow -	H.
582	" 13-17	α Orionis -	$91 + 7$	4	- -	H.
583	" 13-17	Polarids -	$150 + 89$	3	Quick -	H.
584	" 13-17	Perseids -	$51 + 44$	4	Quick -	Bl.; T.
585	" 13-17	Coma -	$201 + 25$	4	Swift -	T.; C.
586	" 13-17	Geminids -	$110 + 38$	4	Quick -	C.
587	" 13-17	Geminids -	$109 + 32$	3	Quick -	H.
588	" 13-14	Leonis -	$165 + 12$	5	Swift -	T.
589	" 12-17	Leonids -	$152 + 23$	36	Swift -	C.
590	" 12-17	Leonids -	$150 + 23\frac{1}{2}$	17	Swift -	Bl.
591	" 12-17	Leonids -	$151 + 23$	9	Swift -	H.
592	" 12-17	Leonids -	$156 + 21$	3	Swift -	T.
593	Dec. 10-15	Geminids -	$109 + 32$	25	Quick -	Bl.
594	" 10-15	Geminids -	$107 + 34$	} 78	Quick -	C.
595	" 10-15	" Castor	$111\frac{1}{2} + 35$			
596	" 10-15	" Gemi- nids.	$103\frac{1}{2} + 30$			
597	" 10-15	β Taurids -	$80 + 28$	6	Slow -	Bl.; C.
598	" 10-15	λ Ursæ -	$154 + 45$	—	Swift -	Bl.
599	" 10-15	Leo Minor -	$162 + 34$	4	Swift -	C.
600	" 10-15	ν Virginis -	$174 + 11$	6	Swift -	Bl.; C.
601	" 10-15	Cancrids -	$123 + 15$	3	Quick -	C.
602	" 12	Geminids -	$97 + 36$	—	Quick -	H.

Observers.

Ba. T. W. BACKHOUSE, Sunderland.

Bl. E. R. BLAKELEY, Dewsbury.

C. H. CORDER, Bridgwater.

D. W. F. DENNING, Bristol.

H. Prof. A. S. HERSCHEL Slough.

P. J. H. POPE, Dingwall.

T. H. J. TOWNSEND Leeds.

FIREBALLS AND BRIGHT METEORS OBSERVED IN 1895.

Date.	Time.	Mag.	Remarks.
1895. Jan. 1 -	h m s 18 25 30	Sirius	Yellow, directed from about γ Ursæ Min. Passed P Camel. Course about 3° . A quick flash. Quadrantid.—T. W. B.
Feb. 2 -	11 56 0	>1	Fading to 1st mag. Orange mostly, but varied in colour. Directed from $121^{\circ}45' + 10^{\circ}$ Dis. $112^{\circ} - 8^{\circ}$ very slow. Path seen 8° . Dur. 1'6 sec.—T. W. BACKHOUSE.
„ 16 -	8 15 0	Sirius	Greenish, leaving a streak. From $60^{\circ} + 22^{\circ}$ to $59^{\circ} + 3^{\circ}$.—H. C.
Mar. 10 -	14 29 0	Sirius	During Lunar Eclipse. Long streak. Divided into two at end.—H. C.
„ 10 -	14 28 0	2	Yellow. Long streak. Falling from fore part of Ursa to top of Corvus. Apparently not same as above.—H. STOCKWELL, Leeds.
„ 10 -	15 25 0	♀	Reddish orange. Swift. Train 3° long. From direction of Mizar. Dis. near 60 Leonis.—J. W. MEARES, Brighton.
„ 16 -	—	>1	Piery red with rocket-like tail. λ Leonis to ϵ Ursæ Min.—JAMES WYKES, Birmingham.
„ 16 -	12 13 0	2	Not swift. Streak-train. Disintegrated at end into cloud of red particles. $203^{\circ} + 32^{\circ}$ to $221^{\circ} + 1^{\circ}$.—E. R. BLAKELEY.
„ 24 -	8 15 0	>1	Quick. Orange flash equal Sirius, leaving streak. $154^{\circ} + 21^{\circ}$ to $153^{\circ} + 12^{\circ}$.—H. CORDER.
Apr. 14 -	12 4 0	2	Very very slow $343^{\circ} + 41^{\circ}$ to $345^{\circ} + 36^{\circ}$. Path 5° . Radiant $190^{\circ} + 58^{\circ}$.—W. F. DENNING.
„ 19 -	10 58 0	2×2	Lyrid. Quick, with streak (<i>see</i> special note).—E. R. B.
„ 19 -	13 51 0	2	Very beautiful Lyrid, nearly white, leaving bright streak at $191^{\circ}45' + 19^{\circ}$, and fainter for 15° of its course. Directed from $\frac{1}{2}(\rho\sigma)$ Bootis. Very quick, 1'1 sec.—T. W. B.
„ 19 -	14 47 0	2	Green, $278^{\circ} + 36^{\circ}$ to $286^{\circ} + 57^{\circ}$. Very fine streak left for 5 minutes, curving round and expanding. Lyrid.—H. C.
May 2 -	9 45 0	2	From direction of γ Draconis, passed near β Cephei, and on further. Long streak for 3 secs. Serpentinid.—G. W. MIDDLETON, Mexborough.
„ 13 -	Dublin M.T. 9 2 0	>♀	Falling with slight tendency to W. in the northern sky, distance about 15° above horizon.—W. H. S. MONCK, Dublin.
„ 24 -	10 45 0	>♀	Blue, pear-shaped, nearly as large as $\frac{1}{2}$ moon, burst in globules. Streak near end $7'$ broad, $\frac{1}{2}^{\circ}$ long. A dull crackling sound heard. Sky misty. Path about from $223^{\circ} + 24^{\circ}$ to $251^{\circ} + 45^{\circ}$.—H. J. TOWNSHEND.
June 10 -	9 59 20	$4 \times ♀$	Yellowish to intense white. From $\frac{1}{2}^{\circ}$ above α Cygni, eclipsing γ Cassiopeia, and went twice as far again. 3 to 4 secs. 85° path.—D. E. PACKER, Selly Park, 3 m. S. of Birmingham.
„ 10 -	9 59 29	>♀	Brilliant blue pear-shaped nucleus $8'$ by $30'$ long, with red and violet train, breaking into two or three coloured fragments. Seen first at $253^{\circ} + 33^{\circ}$, but probably visible before that. Dist. $242^{\circ} + 65^{\circ}$. Duration, 6 secs.—H. J. T.
„ 20 -	12 25 0	♀	Orange streak visible for 2 secs. From $17^{\text{h}} 20^{\text{m}} + 16^{\circ}$ to $16^{\text{h}} 45^{\text{m}} + 22^{\circ}$.—S. J. BURRELL PRIOR, Dulwich.

Date.	Time.	Mag.	Remarks.
1895. June 21 -	h m s 11 25 0	> ♀	Yellow. Long and very brilliant streak. 5 to 8 secs. duration. Seen from North Berwick in the East, passing from N. to S.—Miss M. L. JEFFERYS.
" 29 -	10 50 0	> ♀	Bright blue. Short wavy train 3° long. From α Lacertæ to η Pegasi. Rapid.—C. ROBERTS, Chelsea.
" 29 -	11 8 0	> 1	Orange. Broken train of sparks. Rapid. From α Lyrae to γ Herculis.—C. ROBERTS.
July 7 -	9 44 0	> ♀	Electric blue with red train. Seen in S.S.E. close to the moon, which was blood red, having just risen. Contrast of blue meteor with red moon very striking, as if meteor much nearer. It commenced about $\frac{1}{2}^{\circ}$ above moon and passed in a curved path down to E. of it. Length of path about 3°.—REV. T. H. FOULKES, M.A., 5 m. W. of Leicester.
" 12 -	10 40 0	♀	Brilliant blue. Slow curved path from between α and β Aquilæ to η Serpentis. Com. not seen.—T. W. NEWMAN, Bognor.
" 27 -	13 50 0	4	Greenish blue, with train and streak. From $5^{\circ} + 51^{\circ}$ to $54^{\circ} + 6^{\circ}$. Rather quick.—H. C.
Aug. 2 -	11 53 0	♂	Very red with train. Slow halting motion. 3 secs. $359^{\circ} + 25^{\circ}$ to $30^{\circ} + 18^{\circ}$.—E. R. B.
" 2 -	13 33 0	4	Very swift. No streak seen. Perseid. From $19^{\circ} + 9^{\circ}$ to $13\frac{1}{2}^{\circ} - 8^{\circ}$.—E. R. B.
" 2 -	13 45 0	> ♀	Bright streak. Lightning-like flash at end. Meteor bursting into a cloud of sparks. Perseid. $28^{\circ} + 25^{\circ}$ to $26^{\circ} + 6^{\circ}$.—E. R. B.
" 2 -	13 51 0	Sirius	Silvery streak. Swift. Perseid. $5^{\circ} + 56^{\circ}$ to $315^{\circ} + 55^{\circ}$.—E. R. B.
" 7 -	11 4 0	4	In head of Draco. Cygnid from radiant at $292^{\circ} + 52^{\circ}$.—W. F. D.
" 7 -	12 12 0	Sirius	Bright streak and flash. Swift. Perseid. $38^{\circ} + 65^{\circ}$ to $37^{\circ} + 75^{\circ}$.—E. R. B.
" 7 -	12 55 0	Sirius	Bright yellow, with streak. Perseid. $44^{\circ} + 68^{\circ}$ to $96^{\circ} + 86^{\circ}$.—E. R. B.
" 10 -	11 36 0	4	Appeared from behind clouds. Seen for 25° shooting horizontally about 3° or 4° above β Ursæ Minoris.—REV. S. J. JOHNSON, Bridport.
" 11 -	11 42 0	♀	Bright streak and train. $85^{\circ} + 57^{\circ}$ to $107^{\circ} + 53\frac{1}{2}^{\circ}$. Perseid.—E. R. B.
" 11 -	11 42 0	4	Blue, brightest at end. Lasting streak. $60^{\circ} + 62\frac{1}{2}^{\circ}$ to $70^{\circ} + 64^{\circ}$. Perseid.—H. C.
" 11 -	13 32 0	4	Greenish blue, similar to preceding, with lasting streak. $145^{\circ} + 73^{\circ}$ to $156^{\circ} + 70^{\circ}$. Perseid.—H. C.
" 14 -	12 26 0	Sirius	Rather swift. Streak. Cygnid?? $333^{\circ} + 57^{\circ}$ to $40^{\circ} + 57^{\circ}$.—E. R. B.
" 20 -	7 34 0	—	In daylight, but appeared = Arcturus. Yellow. Streak 1° long. About $180^{\circ} + 50^{\circ}$ to $195^{\circ} + 57^{\circ}$. 2 secs.—H. J. T., I. of Man.
" 22 -	9 0 0	1 (Pale blue. Short tail. $241^{\circ} - 17^{\circ}$ to $244^{\circ} - 26^{\circ}$.—U. ROBERTS, Bournemouth.
" 24 -	10 27 0	> ♀	Bursting red in Draco. Slow 4 to 5 secs. About $5'$ wide $15'$ long, pear-shaped. $273^{\circ} + 45^{\circ}$ to $242^{\circ} + 64\frac{1}{2}^{\circ}$. Probably an α Capricornid.—H. J. T., I. of Man.
Oct. 10 -	21 45 0	$3 \times \varnothing$	In broad daylight. Falling from a point $\frac{1}{2}$ distance between \varnothing and \odot . Length of path 20° . Duration 20 secs. A perfectly round globe $2'$ in diameter.—T. J. MOORE, Hatfield, nr. Doncaster.

Date.	Time.	Mag.	Remarks.
1895.	h m s		
Oct. 24 -	13 35 0	2	Bluish nucleus with orange train and narrow red streak. Ended with a flash. α Cetid.—H. C.
Nov. 9 -	8 2 0	2	From $292^{\circ} + 3^{\circ}$ to $292^{\circ} - 1^{\circ}$. A small green fireball with short orange train. Increased much in brightness.—H. C.
" 9 -	10 15 \pm	$\frac{3}{2}$ (?)	Pear-shaped. Orange. No streak, fell from $113^{\circ} + 26^{\circ}$ to horizon. Cast shadow.—G. T. DAVIS.
" 9 -	10 47 0	8 or 10+?	Bright verdigris green, with tail of red sparks. Slow. $2\frac{1}{2}$ or 3 secs. Path of 22° , $113^{\circ} + 31^{\circ}$ to $119^{\circ} + 9^{\circ}$. —PROF. A. S. HERSHEY.
" 9 -	10 40 \pm	2	Passed between Pollux and Jupiter at angle of about 60° with horizon. Distance $112^{\circ} + 20^{\circ}$ with a bright blue flash! Rapid.—H. LAWTON, Peckham.
" 12 -	6 15 0	?	Small at first, ascending. When 10° below Sq. of Pegasus, burst into flame, vanishing below β Aquilæ. —S. H. BEALE, Banbury.
" 13 -	11 15 0	$2 \times ?$	Slow. Greenish. Bright white streak. Perhaps α Taurid.—E. R. B.
" 13 -	11 28 0	Sirius	$136^{\circ} + 35^{\circ}$ to $79^{\circ} + 50^{\circ}$. Blue, red streak. Rather slow. ϵ Leonis.—H. J. T.
" 13 -	11 40 0	4×2	$210^{\circ} + 35\frac{1}{2}^{\circ}$ to $270^{\circ} + 35\frac{1}{2}^{\circ}$. Slow. Reddish. Alternate jumping and dropping motion. ϵ Leonis.—H. J. T.
" 13 -	12 31 0	2	$96^{\circ} + 24^{\circ}$ to $70^{\circ} + 17^{\circ}$. Golden. Bright streak. Leonid. —E. R. B.
" 13 -	12 50 0	1 to Sirius	$85^{\circ} + 10^{\circ}$ to $106^{\circ} \pm 0^{\circ}$. Very slow. Train. Flickering. Taurid.—E. R. B.
" 13 -	13 0 0	2	Swift. Streak. Golden yellow. Leonid.—E. R. B.
" 13 -	13 35 0	?	Very swift. Streak. Intense golden. Leonid.—E. R. B.
" 13 -	13 50 0	$3 \times ?$	Swift. Bright streak. Leonid.—E. R. B.
" 13 -	14 25 0	Sirius	Swift. Bright streak. Leonid.—E. R. B.
" 13 -	14 26 0	—	Bright flash, like lightning, in N.—E. R. B.
" 13 -	14 56 $\frac{1}{2}$	Sirius	Almost stationary. Leonid.—E. R. B.
" 13 -	15 48 0	Sirius	Quick. Green streak. Flash at end near Coma Ber. Leonid.—H. C.
" 14 -	6 18 0	1	Slow. Orange. Train of flakes. From β Aquarii.—H. C. (also from Reading.—G. T. D.)
" 14 -	12 9 0	Sirius	$91^{\circ} + 46\frac{1}{2}^{\circ}$ to $46^{\circ} + 38^{\circ}$. Very fine, long streak. Blue and red. ϵ Leonis.—H. J. T.
" 16 -	12 32 0	$\frac{3}{2}$ ($213^{\circ} + 55^{\circ}$ to $230^{\circ} + 54^{\circ}$. Very swift. Ten minutes after a dull boom reverberated from all parts of sky. Leonid.—E. R. B.
" 16 -	13 10 0	$> ?$	Directed from $2\frac{1}{2}^{\circ}$ N. of Cor Caroli. Dis. 17h. 48m. $+38\frac{1}{2}^{\circ}$. Path seen, about 7° . Bright green streak.—T. W. B. from Great Ayton. About same time E. R. B. saw a flash, like lightning, at Dewsbury.
" 22 -	6 49 0	$> ?$	From 6h. m. $+48^{\circ}$ to 8h. 10m. $+60^{\circ}$. Very brilliant, and on as a faint spark to 10h. 0m. $+60^{\circ}$. Total duration 2 secs. At first greenish and bright enough to light up country like moon 4 days old. Bright streak left for 20 to 30 secs.—A. S. WILLIAMS, W. Brighton.
" 30 -	5 15 0	2	In twilight from about $330^{\circ} - 2^{\circ}$ to $10^{\circ} - 14^{\circ}$. Train of flakes. Directed from Aquila?—H. C.

Date.	Time.	Mag.	Remarks.
1895. Dec. 10 -	h m s 5 0 ±	☾	Directed from α Cygni. Started near ε Cygni. Ending between ε Pegasi and Altair, nearer former. Slight red train. Slow. $\frac{3}{4}$ sec. Brilliantly white and compared to an arc lamp which was near.—J. W. MEARES, Chelmsford.
" 10 -	5 50 0	> 6	Very slow. 9 secs. From $160^{\circ} + 79^{\circ}$ to $231^{\circ} + 60^{\circ}$.—E. R. B.
" 11 -	13 30 0	Sirius	Green. Streak. Directed from α Ceti. Geminid.—H. C.
" 11 -	19 31 0	—	Bright ball of fire falling towards N.W.—J. M. ROYAL, Portland, per REV. W. R. WAUGH.
" 12 -	12 18 0 $\frac{3}{4}$	♄	Directed from ε Tauri. Dis. $33^{\circ} + 31^{\circ}$ Geminid.—T. W. B.
" 12 -	12 19 0 $\frac{1}{2}$	♄	$112\frac{3}{4}^{\circ} + 45^{\circ}$ to $114^{\circ} + 49^{\circ}$. Geminid, but not same as above.—E. R. B.

Notes on Large Fireballs.

September 27, 1894.—About 6^h 30^m a brilliant ball of blue fire passed over Richmond, Cape Colony. It had an apparent diameter fully one-fourth that of the moon. It was moving overhead and due south, and in two seconds it burst, but no sound was heard, although at Murray, about 45^m S. from Richmond there was a heavy explosion, and at a farm 20^m off the noise was so violent that windows were rattled. Observer, Thomas Kyd, M.A.

November 9, 1894.—Two or more bright meteors were seen on this night; but the observations did not work out well. Prof. A. S. Herschel sends the following account of the Great Fireball at 10^h 47^m. It was "8 or 10 × ♀, bright verdigris or grass-green, with tail of red sparks; duration, 2 $\frac{3}{4}$ or 3 seconds, slow speed; from one-half (α — β) Geminorum to two-sevenths (Procyon — ♃), at first small, orange-red, the nucleus growing gradually brighter, and the tail of red sparks longer, to about the middle of its course. From this point to near its extinction the brightly shining green nucleus was nearly round, about one-fifth of the moon's apparent diameter in length and width, followed with slightly greater width and to a length of about 1 $\frac{1}{2}$ × moon's diameter, by a fading scattered tail of bright red sparks. The bright nucleus faded rather suddenly, but without explosion, to a knot of orange and red sparks again (moving?), some 3° or 4° before the latter remnants of the meteor also gradually died out. No persistent light-streak was seen on any portion of the track, though the meteor was observed in full view from first to last, in a sky quite clear and dark in the N.E. where the moon, just risen and past its third quarter, was a dull red crescent only, producing no impediment to good vision by its brightness. No sound of an explosion, though listened for for several minutes, followed the meteor's disappearance, and neither the sky nor surrounding objects appeared to be much lighted up by its effulgence, apparently owing to the deep green colour of the meteor's light."

PARTICULARS OF DOUBLY OBSERVED METEORS, 1895. *Contributed by W. F. DENNING.*

Date.	Time.	Mag.	Height at Be- ginning.	Height at Ending.	Length of Path.	Velocity (per second).	Began over.	Ended over.	Radiant.	Observers.
1895.										
Jan. 1	h m 6 43	2½-3	58	47	Miles. 30	Miles. 13	Corwen, N. Wales	4 miles E. of Moun- gomery. E.N.E. of 13 miles Aberystwith, Between Lundy Isle and Ilfracombe.	233 + 56 <i>Quadrantid.</i> 62 - 12 <i>Britanid.</i> 330 + 59 <i>Cepheid.</i>	W. F. D.; H. C. W. F. D.; H. C.
Mar. 10	14 27	2½-2	50	23	58	19	Llandilo	-	-	H. C.; A. Mee; H. Stock- well; A. H. Baxter, and others. G. T. D.; J. W. Meares, and others. A. S. Herschel; W. F. D.
" 10	15 24	2½	80	40	41	-	Newport, Isle Wight.	4 miles S.W. of Isle of Wight.	240 + 63 <i>Draconid.</i> 316 + 31 <i>5 Cygnid.</i> 209 + 30 <i>Larid.</i> 300 + 20 <i>Sagittid.</i> 359 - 23 <i>Ophiuchid.</i> 217 - 6 <i>Virgid.</i> 45 + 47 α-β <i>Persid.</i> 333 + 26 <i>Lacertid.</i> 38 + 57 <i>Persid.</i> 48 + 60 <i>Persid.</i> 36 + 57 <i>Persid.</i> 32 + 52 <i>Persid.</i> 319 - 9 β <i>Aquarid.</i> 50 + 30 <i>Taurid.</i>	W. F. D.; H. C. W. F. D.; H. C.
April 14	11 44	1	87	71	107	49	English Channel	English Channel	-	H. C.; A. Mee; H. Stock- well; A. H. Baxter, and others. G. T. D.; J. W. Meares, and others. A. S. Herschel; W. F. D.
" 19	10 59	1-½	91	43	97	33	North Sea	10 miles E. of Lincoln	-	H. C.; E. R. B.; D. F. Packer; W. F. D. W. F. D.; H. C.
" 19	11 46	1	77	70	40	50	6 miles S. of Amesbury	5 miles N.E. of Yeovil	-	D. Booth; H. J. T.; D. E. Packer. Many observers.
June 10	9 59	Fireball	58	44	89	-	8 miles N.W. Spalding	12 miles N.E. Leeds	-	W. F. D.; H. C.
July 7	10 49	2	53	30	79	9	Bath	Buckingham	-	W. F. D.; H. C.; A. S. Herschel. W. F. D.; H. C.
Aug. 7	10 12	2-3	43	28	42	-	Bromyard	Crickhowell	-	A. S. H.; W. F. D. A. S. H.; H. C. A. S. H.; H. C.
" 7	11 4	1-2	74	45	33	-	Newport, Mon.	El Brock, Glam.	-	G. T. D.; H. C.; S. A. Saunders. H. C.; Rev. F. H. Foulkes.
" 7	11 28	2	105	63	64	-	Stratford-on-Avon	Oldbury-on-Severn	-	
" 11	10 7	4	78	62	30	-	Buckley, Northampton	Faringdon	-	
" 11	10 56½	1	95	61	53	-	Oxford	Devizes	-	
" 11	11 42½	2½	75	52	34	-	Stratford-on-Avon	Great Malvern	-	
Nov. 14	6 20	2	49	29	40	-	Ringwood	Easton, Wilts	-	
Dec. 11	14 58	1-2	53	18	63	-	Middle of path 50 miles S. of Devonport	-	-	

Southern Meteor Radiants.

NEW SOUTH WALES OBSERVATIONS.

Mr. W. F. Gale has sent in a number of observations of shooting stars made by Members of the New South Wales Branch, and Mr. Denning has kindly laid them down on his globe and finds a number of showers more or less distinctly marked. As exact details of the paths were not generally given, the radiants are, of course, somewhat uncertain, but they are of considerable value as so little is known of the southern radiants; and it is much to be hoped that Mr. Gale and his fellow workers will follow up the study. They have a much better chance of observing the fine showers of Aquarids, and others just S. of the equator than we have, and it will be seen that a good many of these were observed at the end of July.

Date, 1895.	Constellation.	Position.	No. of ψ_s .	Observer.
July 22—Aug. 12 -	θ Scorpil -	$26^\circ - 43^\circ$	4	Gale.
" " -	Hydra -	$200 - 28$	4	"
" " -	Toucanus -	$350 - 62$	5	"
" " -	Aquarids -	$330 - 9$	6	"
July 26—31 -	" -	$332 - 9$	9	McDonall.
July 31 -	Capricornus -	$300 - 10$	5	"
Aug. 10—12 -	Sagittarius -	$285 - 20$	4	"

Beside these there are indications of radiation from Canis Maj. in May ($99^\circ - 19^\circ$), also from near β Hydræ and η Aquilæ.

In June from α Scorpil, Ursa, Leo, Crater and Crux ($128^\circ - 7^\circ$).

In July from Sagitta, Pisces, $348^\circ = 0^\circ$. Dorado, Cetus, and α Eridani.

In August from Perseus, Fomalhaut ($335^\circ - 40^\circ$), Sagittarius $300 - 39$, Cygnus, Pisces, and Ophiuchus.

In September from β Scorpil ($237^\circ - 20^\circ$).

In October from Pavo ($260^\circ - 66^\circ$), Telescopium $280^\circ - 50^\circ$.

In November Pavo $339^\circ - 79^\circ$, Aries, and Taurus.

In December a bright green Geminid was seen, but the above are only guesses from one or two meteors only.

FIREBALL OF NOVEMBER 22, 1895.

Mr. Denning has worked out a path for this fine meteor, using Mr. A. S. Williams' observation from West Brighton and seven others, most of which, however, were made under unfavourable circumstances. It appears to have been a Taurid from $58^\circ + 22^\circ$, and its visible path was from a height of about 34 miles over the Thames to 17 miles over Greenwich. Real length of path 45 miles. Velocity 22 miles per second.

SECTION FOR THE OBSERVATION OF VARIABLE STARS.

DIRECTOR.—J. E. GORE, F.R.A.S., M.R.I.A.

REPORT OF THE SECTION, 1894—95.

The work of the Section during the last two years has been directed to a search for “new” or “temporary stars” along the course of the Milky Way, and the observations of some selected known and suspected variable stars. The search for “new” stars has not proved successful, and considering the rarity of these remarkable objects, failure in such a search is not surprising.

The Director wishes to call the attention of some Members of the Section to the necessity of comparing the object observed, with, at least, two other stars, one brighter and the other fainter than the object under observation. As these comparison stars can be measured with the photometer, the magnitude of the known or suspected variable star, at the time of observation, can be determined. The comparison should be made in “steps.” Thus, if we call the brighter comparison star a and the fainter b , and the variable star (or suspected variable) V , then, dividing the difference in light between a and b into ten steps, we can record an observation as a 1 V 9 b , or a 2 V 8 b , or a 3 V 7 b , or a 4 V 6 b , and so on (the brightest star being always placed first). This is the only accurate method of making observations with the eye alone; such vague observations as $5\frac{1}{2}$ mag., 6 mag., &c., being of no practical value. The Director requests that in future all observations sent to him be made by the method above indicated.

U ORIONIS.		U MONO-CEROTIS. (See Plate III., Fig. 7.)		1894.		1895.	
1894.		1895.		June 2	6.7	Jan. 5	12.0
Feb. 9	6.4	Jan. 25	6.0	" 13	7.1	" 25	12.5
" 19	6.4	Dec. 12	6.0	" 18	7.6	" 26	12.7
" 21	6.6	" 14	6.2	" 22	7.9	June 15	7.7
" 27	7.2	1896.		Oct. 26	6.3	Aug. 26	9.1
Mar. 8	7.3	Jan. 4	6.8	1895.		Dec. 15	10.6
" 14	6.6	" 5	7.0	Jan. 3	7.3		
" 18	6.8	" 7	7.1	" 18	7.5	R CRATERIS.	
" 20	7.3	" 8	7.2	" 19	7.0	1894.	
" 24	7.2			" 25	6.7	Mar. 14	8.6
" 28	7.3			Feb. 11	6.5	April 26	8.4
Apr. 8	7.5			" 19	5.5		
" 9	7.5	S ANTLÆ.		Mar. 1	5.4		
" 18	7.7	1894.		" 3	5.4	T URSÆ	
" 22	7.8	April 26	6.7	" 3	5.5	MAJORIS.	
" 25	8.0	May 9	6.8	" 15	5.5	1894.	
Oct. 10	11.0?	" 14	6.8	" 27	5.3	Jan. 26	8.9
Nov. 2	9.5	" 25	6.7	Apr. 3	6.1	" 28	8.8
" 4	9.1	1895.		" 24	6.3	" 31	8.9
" 9	9.1	Jan. 19	6.6	May 28	8.0	Feb. 5	9.1
" 20	9.5	Feb. 18	6.8	June 7	8.2	" 12	9.4
Dec. 21	9.0			Dec. 12	6.3	" 22	9.6
1895.		— LEONIS		U HYDRÆ.		" 27	10.0
Jan. 15	9.2	(In Harvard		1894.		Mar. 14	10.5
" 18	8.8	Photom.,		Feb. 27	5.4	Apr. 2	11.5
" 19	8.8	No. 1748,		Mar. 14	5.5	June 22	11.0
" 26	7.8	Sextantis.)		" 15	5.4	July 17	8.2
Feb. 25	6.6			" 25	5.5	Aug. 6	7.4
Mar. 11	6.4	1894.		" 25	5.5	" 25	7.4
" 15	6.4	Jan. 3	6.0	Apr. 5	5.7	1895.	
" 27	6.6	" 26	6.2	" 12	5.7	Jan. 20	12.0
Apr. 23	8.6	" 28	6.1	" 26	5.7	Feb. 1	Invis.
Dec. 14	9.8	Feb. 5	6.2	May 3	5.7	Mar. 3	10.5
		" 9	6.2	" 9	5.7	June 15	9.1
		" 22	6.2	" 14	5.4	Aug. 26	Invis.
		" 27	6.2	" 25	5.7		< 12.5
		Mar. 14	6.3	June 2	5.4	S URSÆ	
		Apr. 5	6.1	" 13	5.4	MAJORIS.	
		" 22	6.1	1895.		1894.	
		May 25	6.1	Mar. 15	5.4	Jan. 26	8.6
				" 27	5.4	" 28	9.0
				Apr. 24	5.7	" 31	9.0
				Dec. 12	5.7	Feb. 5	9.0
						" 12	9.6
						" 22	10.0
						" 27	10.5
						Mar. 14	10.8
						Apr. 2	11.4
						June 22	8.6
						July 17	7.9
						Aug. 6	7.9
						" 25	7.7
						1895.	
						Jan. 20	8.5
						Feb. 1	8.8
						Mar. 3	7.8
						June 15	12.0
						Aug. 26	9.6

R HYDRÆ.		S BOÖTIS.		1894.		Z SCORPII.	
1894.		1894.		July 17	12.2	1894.	
Feb. 27	6.9	Mar. 14	11.0	Aug. 6	10.1	Feb. 27	12.0
Mar. 25	7.4	Apr. 2	9.9	" 25	9.0	Apr. 26	11.9
Apr. 2	8.1	June 22	9.2	Oct. 2	8.9	May 9	12.1
" 10	8.0	July 17	10.5	" 16	8.8	" 14	12.4
" 26	8.7	Aug. 6	11.3	Nov. 21	8.9	" 25	12.0
May 9	8.9	" 25	12.0	1895.		June 2	12.2
" 14	8.9	Oct. 2	12.5	Jan. 2	10.5	" 4	11.2
" 25	9.1	" 16	Invis.	" 20	10.0	" 29	10.7
June 3	9.6	1895.		May 13	10.8	Aug. 3	10.9
" 18	9.7	Mar. 3	9.4	June 15	9.3	" 14	10.8
" 27	10.0	Aug. 26	11.3	Aug. 26	9.0	" 22	10.7
July 4	9.7	Sept. 27	9.9	Sept. 27	10.2	Sept. 23	10.7
" 16	9.7			Nov. 28	Invis.	Oct. 2	10.8
1895.				Dec. 15	(?) Invis.	1895.	
Jan. 18	5.0	θ BOÖTIS.			< 13	June 7	11.0
Mar. 27	7.2	1895.		— LIBRÆ.		" 10	12.0
Apr. 3	7.1	Sept. 26	4.2	1894.		July 6	11.8
" 24	7.8	" 27	3.9	Apr. 26	8.0	Aug. 22	11.0
May 22	8.8	Oct. 4	4.2	May 25	8.3	Sept. 5	11.3
" 27	8.8	" 13	4.3	June 6	8.6	" 26	10.7
June 7	8.8	Nov. 8	4.3	" 21	9.3	X SCORPII.	
July 13	8.7			July 4	9.5	1894.	
W HYDRÆ.		VIRGINIS.		" 29	10.8	Feb. 27	11.5
1894.		1894.		Aug. 25	11.5	Apr. 26	11.3
Feb. 27	8.0	Apr. 11	7.8	μ CORONÆ.		May 9	12.0
Apr. 2	8.2	" 25	8.0	1895.		" 14	11.5
" 10	8.0	" 26	7.8	Sept. 25	5.2	" 25	Invis.
" 26	8.0	May 3	7.9	" 26	5.4	1895.	
May 9	7.9	" 9	8.0	" 27	5.3	June 7	11.5
" 14	7.7	" 14	8.3	Oct. 4	5.2	" 10	11.9
" 25	7.6	" 25	8.5	" 13	5.2	July 6	Invis.
" 26	7.0	June 6	8.5	Nov. 8	5.1	Aug. 22	< 11.3
June 2	6.8	" 23	9.0			Sept. 26	Invis.
" 3	6.8	July 4	10.0	R 2 LIBRÆ.		Y SCORPII.	
" 6	6.7	" 22	10.4	(See Plate III.,		1894.	
" 13	6.7	Aug. 22	11.0	Fig. 9.)		Never seen from	
" 18	6.7	R CAMELO-PARDI.		1894.		from Feb. to	
" 21	6.8	1894.		Apr. 26	11.0	Sept., and cer-	
" 23	6.7	Jan. 2	8.8	May 25	10.8	tainly < 12.5	
" 27	6.7	" 20	8.6	June 6	9.3	to observa-	
July 4	6.6	" 26	8.6	" 21	8.8	tions.	
" 16	6.4	" 28	8.8	July 4	8.7	g HERCULIS.	
" 21	6.5	Feb. 5	8.8	" 29	8.5	1895.	
" 29	6.7	" 12	8.8	Aug. 22	8.9	Sept. 13	4.9
Aug. 10	Not	" 27	9.3	" 25	8.9	" 22	4.9
	identi-	Mar. 14	9.5	1895.		Oct. 4	4.7
	fied—	Apr. 2	10.8	Aug. 22	10.4	" 13	4.9
	too	" 10	10.8	Sept. 26	11.4	Nov. 8	5.1
	low.	May 7	12.0			" 15	5.0
1895.		" 24	12.6			" 26	5.3
Jan. 18	9.0	June 4	13.0			" 28	5.1
Apr. 3	8.4	" 22	Invis.				
May 13	8.0						
" 22	8.0						
" 27	8.3						
June 7	8.3						
July 13	6.8						

R URSÆ MINORIS.		C.D.M. -30°, No. 13,626, SCORPII.		1895.		1894.	
1894.		1894.		Oct. 4	5.0	July 28	6.5
Jan. 2	9.6	May 15	7.0	" 13	5.6	" 29	6.8
" 20	9.5	" 25	6.9	" 28	5.0	" 30	6.9
" 26	9.6	June 6	6.1	Nov. 8	4.9	Aug. 2	7.2
" 28	10.0	" 13	6.3	" 15	5.1	" 3	7.2
Feb. 5	9.6	" 21	6.7	" 20	5.3	" 10	7.2
" 27	10.0	" 23	6.7	" 26	5.3	" 18	6.2
Mar. 14	10.0	" 25	6.9	" 28	5.3	" 22	6.2
Apr. 2	9.6	July 4	7.0			" 27	6.1
" 10	10.0	" 22	7.2	Y OPHIUCHI.			
May 7	10.0	" 28	7.3	1894.		Sept. 10	4.9
June 4	10.0	" 29	7.5	May 15	6.4	" 19	5.5
" 22	10.5	Aug. 2	8.0	June 23	6.5	" 23	5.6
July 17	10.5	" 14	8.6	" 25	6.4	" 25	5.5
Aug. 6	10.0	" 22	9.0	July 21	6.2	Oct. 1	6.0
" 25	10.0	" 25	9.0	" 29	6.2	" 2	6.0
Oct. 2	10.0	Sept. 18	9.2	" 30	6.5	" 3	5.8
" 16	9.5	Oct. 2	9.7	Aug. 3	6.0	" 6	5.7
Nov. 21	9.6	1895.		" 18	6.2	" 9	5.7
1895.		June 10	9.1	" 27	6.5	" 10	5.8
Jan. 21	10.3	July 6	9.7	Sept. 19	6.2	" 13	6.0
May 13	10.0	" 18	9.7	" 23	6.8	" 16	6.1
June 15	10.0	" 31	Invis.	Oct. 1	6.5	" 18	6.1
Aug. 26	9.6	Aug. 6	10.0	" 2	6.3	" 25	5.8
Sept. 27	9.5	Sept. 2	9.8	" 3	6.6	" 27	5.5
Dec. 15	10.0			" 6	6.3	" 31	5.2
R DRACONIS.		— SCORPII.		" 9	6.4	Nov. 7	4.8
1894.		1894.		" 13	6.2	" 9	4.9
Jan. 2	8.2	June 6	Invis.	" 16	6.3	" 14	5.1
" 26	7.5	" 13	<13	" 18	6.2	" 17	5.5
" 28	7.5	" 21	Invis.	" 25	6.4	" 21	5.6
Feb. 5	7.6	" 29	<12	" 27	6.2	" 27	5.8
" 27	8.2	Aug. 22	12.0	" 31	6.8	1895.	
Mar. 14	9.4	1895.		Nov. 9	6.3	June 10	6.5
Apr. 2	10.8	June 10	Invis.	" 17	6.4	July 13	5.3
" 10	10.8	July 18	Glmps'd	" 21	6.8	" 18	5.5
May 7	12.0	Aug. 6	Glmps'd	1895.		" 31	5.7
June 4	12.3	" 11 (?)	11 (?)	July 18	6.6	Aug. 6	5.4
" 22	12.4	" 11 (?)	11 (?)	Aug. 9	6.8	" 9	5.5
July 17	11.8			Sept. 17	6.2	" 21	5.3
Aug. 6	11.2			" 20	6.2	Sept. 1	4.9
" 25	9.0			" 26	6.4	" 2	4.9
Oct. 2	7.6			Oct. 13	6.3	" 14	6.1
" 16	8.2			" 22	6.0	" 17	6.2
" 22	7.6			Nov. 8	6.2	" 20	6.2
Nov. 21	8.6					" 22	6.2
1895.		u HERCULIS.		R SCUTI.			
Jan. 21	12.0	1895.		1894.		Oct. 5	7.6
May 13	7.9	Aug. 26	5.0	Apr. 26	6.1	" 13	7.6
June 15	7.6	" 28	5.0	May 14	5.5	" 18	7.2
Aug. 26	11.5	" 29	5.0	" 25	5.5	" 20	7.1
Sept. 27	12.0	Sept. 2	5.0	June 3	5.5	" 22	7.2
Nov. 28	11.2	" 5	5.0	" 6	5.5	" 28	6.9
Dec. 15	9.3	" 13	5.0	" 13	5.5	Nov. 2	6.2
1896.		" 22	5.0	" 21	5.5	" 8	5.7
Jan. 5	7.6			" 23	6.1	" 15	5.6
				July 4	6.1	" 20	5.4
				" 16	6.3	" 28	5.2
				" 21	6.5	" 30	5.1
						Dec. 2	5.3

R LYRÆ.		1895.		1895.		1894.			
		Nov. 30	4.4	June 10	7.6	June 25	10.9		
		Dec. 1	4.4	July 13	7.6	Aug. 14	Invis.		
1895.		" 2	4.6	" 18	8.2	Oct. 3	12.8		
July 6	4.8	" 5	4.4	" 18	8.1	Nov. 15	Invis.		
" 13	4.9	" 7	4.3	" 31	8.1	Z SAGITTARIÆ.			
" 16	4.4	" 14	4.3	Aug. 6	7.7				
" 17	4.6	" 15	4.6	" 9	7.7				
" 18	4.4	" 15	4.4	" 21	8.1				
" 24	4.4	" 21	4.3	Sept. 1	7.7				
" 29	4.3	" 24	4.4	" 2	7.7				
" 30	4.7	1896.		" 14	7.6				
" 31	4.5	Jan. 6	4.4	" 17	7.6				
" 31	4.4	" 8	4.4	" 20	7.6				
Aug. 2	4.4	— AQUILÆ.		" 22	7.3				
" 5	4.4			" 24	7.1				
" 5	4.3			" 26	7.2				
" 6	4.4			" 27	7.0				
" 7	4.4			Oct. 5	7.0				
" 9	4.5			" 13	6.9				
" 10	4.4			" 18	7.4				
" 11	4.5			" 20	7.6				
" 21	4.4			" 22	7.1				
" 22	4.3			" 28	7.0				
" 24	4.7			Nov. 2	7.0				
" 24	4.4			" 8	7.0				
" 25	4.4			" 15	7.0				
" 26	4.3			" 20	7.1				
" 27	4.5			" 26	7.1				
" 28	4.6			" 28	7.6				
" 29	4.3			" 30	7.1				
Sept. 1	4.4			Dec. 2	7.2				
" 2	4.5			T SAGITTARIÆ.					
" 5	4.5								
" 7	4.7								
" 10	4.8								
" 13	4.8								
" 14	4.7								
" 16	4.8								
" 17	4.6								
" 19	4.6								
" 20	4.6								
" 20	4.6			R SAGITTARIÆ.					
" 22	4.7								
" 22	4.4								
" 24	4.3								
" 25	7.6								
" 27	7.7								
Sept. 10	7.3								
" 18	7.6								
" 23	7.6								
" 25	7.6								
Oct. 1	7.7			1894.					
" 2	7.5			June 25	8.8				
" 3	7.2			Oct. 3	11.5				
" 6	7.7			S SAGITTARIÆ.					
" 9	7.4								
" 10	7.3								
" 13	7.4								
" 16	7.3								
" 18	7.4								
" 25	7.5								
" 27	7.5								
" 31	7.3								
Nov. 9	7.4							χ CYGNI.	
" 14	7.7								
" 17	7.6			Jan. 2	6.4				
" 21	7.6			" 13	7.3				
" 24	7.6			Nov. 21	6.9				
" 27	7.5			" 23	6.9				
" 31	7.3			" 27	6.2				
Nov. 9	7.4			" 28	6.1				
" 14	7.7			Dec. 1	5.0				
" 17	7.6	" 15	4.5						
" 21	7.6	" 21	4.3						
" 24	7.6	" 26	4.2						
" 27	7.6	There was an error on the mag. of Nov. 2 (see Report, Vol. III., Part II.), therefore the observations are all repeated since 1893.							
		Oct. 13	12.5						
		" 23	Invis.						
		Nov. 2	10.6						

SUMMARY OF OBSERVATIONS OF VARIABLE STARS 1894-95.

Name.	R.A. 1900.	Dec. 1900.	Obs.	Name.	R.A. 1900.	Dec. 1900.	Obs.
AGC 157 Sculpt.	h m 0 10' 4	-32 36	13	— Libræ	h m 15 18' 5	-22 34	7
T Cassiopeiæ	0 17' 8	+55 44	20	μ Coronæ	15 32' 0	+39 21	6
S Ceti	0 19' 0	-9 53	12	R ₂ Libræ	15 50' 6	-18 1	16
S Cassiopeiæ	1 12' 3	+72 5	12	Z Scorpii	16 0' 1	-21 28	19
R Arietis	2 10' 4	+24 23	7	X Scorpii	16 2' 7	-21 16	10
T Persei	2 12' 2	+58 29	9	Y Scorpii	16 23' 0	-19 3	6
o Ceti	2 14' 3	-3 26	83	g Herculis	16 25' 0	+42 6	8
S Persei	2 15' 7	+58 8	10	R Ursæ Min.	16 31' 3	-79 29	24
R Ceti	2 20' 9	-0 38	3	R Draconis	16 32' 4	+66 58	26
U Ceti	2 28' 9	-13 35	3	C D M 13626 Scorpii - 30	16 50' 3	-30 26	23
X Tauri	3 47' 8	+7 28	16	— Scorpii	16 56' 8	-36 46	8
λ Tauri	3 55' 1	+12 12	4	u Herculis	17 13' 6	+33 12	15
— Coeli	4 37' 1	-38 26	7	Y Ophiuchi	17 47' 3	-6 7	33
R Leporis	4 55' 0	-14 57	35	R Scuti	18 42' 7	-5 49	72
R Aurigæ	5 9' 2	+53 29	5	R Lyræ	18 52' 3	+43 49	72
C D M 2538 Columb. - 29°	5 47' 2	-29 19	7	— Aquilæ	18 59' 1	-5 50	24
α Orionis	5 49' 7	+7 23	24	T Sagittarii	19 10' 5	-17 9	2
U Orionis	5 49' 9	+20 10	31	R Sagittarii	19 10' 8	-19 29	4
R Lyncis	6 53' 1	+55 29	4	S Sagittarii	19 13' 6	-19 13	4
R Can. Maj.	7 14' 0	-16 2	4	Z Sagittarii	19 13' 8	-21 7	8
U Monocerotis	7 26' 0	-9 34	7	B D Aquilæ + 4°; 4230.	19 46' 5	+4 13	16
S Antilæ	9 27' 9	-28 11	6	χ Cygni	19 46' 7	+32 40	24
— Leonis	9 40' 9	+7 10	11	C D M 16646 Sagit. - 29.	19 49' 7	-29 26	16
R Leonis	9 42' 2	+11 54	35	— Sagittarii	19 51' 8	-42 7	7
U Hydræ	10 32' 6	-12 52	17	— Sagittarii	20 9' 4	-39 29	
R Ursæ Maj.	10 37' 6	+69 18	17	— Aquarii	20 41' 2	-4 26	
R Crateris	10 55' 6	-17 47	2	T Aquarii	20 44' 7	-5 31	9
T Ursæ Maj.	12 31' 9	+60 3	18	T Cephei	21 8' 2	+68 5	20
S Ursæ Maj.	12 39' 6	+61 39	18	T Capricorni	21 16' 5	-15 35	3
R Hydræ	13 24' 2	-22 46	21	Y Capricorni	21 28' 9	-14 25	6
W Hydræ	13 43' 4	-27 52	28	S Cephei	21 36' 5	+78 10	14
S Bootis	14 19' 5	+54 16	11	S Piscis Austr.	21 58' 1	-28 32	1
θ Bootis	14 22' 0	+52 18	5	R Piscis Austr.	22 12' 3	-30' 6	1
— Virginis	14 22' 3	+5 7	12	R Cassiopeiæ	23 53' 3	+50 50	1
R Camelop.	14 25' 1	+84 17	28				

STARS WHICH WERE NEVER SEEN AND ARE PROBABLY ERRORS
OF THE S.D.M.

Number.	A.R. 1855.	Dec. 1855.	Magns.
— 3, No. 370	h m s 2 16 50·1	— 3 30·9	9·8
— 5, No. 5359	20 36 46·4	— 5 21·6	9·0
— 15, No. 6531	23 54 41·7	— 15 29·5	8·4

Observations of Variable and Suspected Variable Stars.

By MISS E. BROWN.

Suspected Variable Stars. (List I.)

No.	Star.	Supposed Change of Mag.	Date of Obser- vation.	Estimated Colour and Mag.
3	Birm. 420 Ophiuchi	7·5—11	14 Aug. 1895	7 mag., or brighter, pale orange.
	Birm. 422 Ophiuchi	7—8½	14 "	9 mag. (clear between passing clouds).
	68 Ophiuchi	4·4—5·1	14 "	5 mag., white.
			16 "	4·4, very bright.
5	Lalande 35,150 Serpentis	Query? Aquilæ of Harvard Photometry.	17 "	4·4 (a distant comet?).
			14 "	5·5 mag., white.
			16 "	5·5 or 6 mag.
			17 "	5·8 mag.
			20 "	6 mag., 24 Aug. 1895, 5·5 or 6 mag. (very clear).
6	θ Serpentis	—	4 "	The f. the fainter.
			14 "	5 and 5·5, the f. the fainter and slightly yellow.
			16 "	5 mag., the red star in field; 8 mag., pale red. (Red star in R.A. XVIII. 49. Dec. 4 ^h 12' +).
			8 "	Brighter than 5 and 5·5, perhaps from good seeing.
			20 "	4·5 and 5 mag. (very clear), both white.
			24 "	Much the same as before (red star orange red).
			22 Sept. 1895	5 and 5·5 mag., almost white, also observed in 1892; for colour, white or tinge of yellow.
7	12 Aquilæ	3·8—5	14 Aug. 1895	4 mag., yellow (y3).
			16 "	4 mag., orange y. 17 Aug. 1895, 3·8 mag.
			18 "	4 mag., deep y. 20 Aug. 1895, 4 mag.
			14 Sept. 1895	4 or 4·5 (hardly dark). 20 Sept. 1895, 4 mag. (Observed in 1892, orange y or y. 12 Aug. 1892, 4·5 mag.).

No.	Star.	Supposed Change of Mag.	Date of Obser- vation.	Estimated Colour and Mag.
8	Birm. 483 Aquilæ	6·5—8	14 Aug. 1895	7·5 mag. or 8, very red.
			16 "	7 mag. 17 Aug. 1895, 7 or brighter, very red.
			20 "	7 or 6·8. 14 Sept. 1895, 7 mag. or 6·5 brighter than three stars in a line in field.
			22 Sept. 1895	6·5 mag.
9	Birm. 487 Vulpec.	6—7·5	14 Aug. 1895	6·5 mag., orange, fainter than a p. star in field.
			16 "	6 mag. (The p. 5 or 5·5), decided orange.
			17 "	6 mag., about 1 mag. fainter than the p. star.
			20 "	6·5 mag., fainter than the p. by 1 mag.
			24 "	6 mag., more than 1 mag. fainter than the p.
10	Lalande 36,099, Vulpeculæ	6—6·7	14 "	6 mag., several stars in field not far from meridian; chiefly clear, no moon.
			16 "	6·5 mag.
			17 "	6 mag., white.
			20 "	6·5 mag. (very clear).
			24 "	6 mag., white. 27 Aug. 1895, doubtful observation.
12	Birm. 492, Cygni	7—9	14 "	6 or 6·5 mag., brightest in field, a pair s.f., 7 mag. (clouds passing).
			17 "	6·5 mag., orange.
			24 "	Doubtful observations, a 6·5 pale s.p.
			27 "	7·5, decided orange.
			21 Sept. 1895	6·5 mag., orange, pair to the s. about 7 mag.

Known Variable Stars. (List I.)

	T Sagittæ	Max. Aug. 20, 1895. Mag. 8·3—9·9	14 Aug. 1895	Faint stars in field in a curve and a 7 mag.
			17 "	A 6·5 in field (doubtful).
			27 "	Only very faint stars near centre of field.
			24 Sept. 1895	A 6 mag. in field (not identified probably).
	S Vulpeculæ	Max. Sept. 3 Mag. 8·6—9·5	25 "	A 6·5 or 7 mag., faint stars, nine or more in a curve.
			17 Aug. 1895	Not identified. 21 Aug. 1895, not identified.
			21 Sept. 1895	A pale or. 8 mag.? 27 Aug. 1895, 9 mag., pale or.
			22 "	A crowded field, a bright star f. and also p.
1	R Vulpeculæ	Max. Sept. 25 Mag. 8—13·1	25 "	7·5 mag., orange R.? (Doubtful if identified.)
			15 "	8 mag., very pale or. 17 and 19 Sept. 1895, not identified.
			21 "	8 mag., pale or., 22 and 25 Sept. 1895, not identified. (A pale or., brighter star in field, besides others.) Also not identified 10 and 16 Oct. 1895.
	R Pegasi	Max. Aug. 22 Mag. 7·4—13	14 Oct. 1895	A very faint star in the centre of field.
			18 "	A faint star in centre of field 11 or 12?

November 12, 1895.

Observations of Variable Stars.

By JOSEPH T. WOOD.

S CETI.—Observations made = 7. At max. when obs. commenced—

		S	
		.2	
		.6	
Comparison stars	p	3.	f
near S Ceti		4	.S
			.5

N

Estimated mags. Oct. 10, 1895.

2 = 8 mg. 4 = 7.75—8 mg. 3 = 8.5 mg. 5 = 9 g.
6 = 11 mg. S = 7.6 mg., reddish.

Oct. 17.—Not much change.

Oct. 24.—Not seen, owing to mist on the horizon.

Nov. 9.—Star marked 5 appears fainter than before; est. S = 8 mg.

Dec. 7.—(Absent from England Nov. 10—Dec. 6); very great change. S less than 2; est. it 9—9.2 mg.

Dec. 15. S = 9.5 mg.

R ARIETIS.—Seven observations.

	S	stars near R Arietis.
5		
.	.21	21 = 5.69 mg. (U.Ox.)
p	4	.R f
	.3	3 = 9.5—10 mg., var.?
		4 = 10.5—11.
N		5 = 11.5—12.

Oct. 10.—Est. R = 8.2 mg.

Oct. 16.—More than 2 mgs., less than 21. Slightly more than 1 mg., above 3.

Oct. 24.—No noticeable difference in R, think it about as bright as last obs.

Nov. 9.—Not much change; think R .5 mg., less than last obs.

(See note to S Ceti.)

Dec. 7.—Considerable change, R very slightly less than 3, perhaps 9.5—9.7 mg.

Dec. 15.—Est. R = 10 mg., very little brighter than 4.

Jan. 17, 1896.—R = 5 = 11.5 mg.? 3 seems also much fainter, is *certainly* no brighter now than 5.

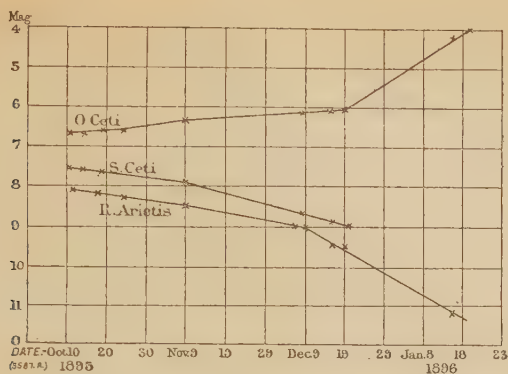


FIG. 10.

ε CETI (MIRA).—Observations 10.

Comparison stars. δ Ceti = 4.2 (U. Ox.). 67 Ceti = 5.84 (U. Ox.).

Oct. 10.—Est. Mira = 6.6—6.75.

Oct. 16.—Not vis. naked eye. 6.6.

Oct. 23.—A little brighter than Oct. 16, but not vis. naked eye. 6.5 mg.

Oct. 24.—Very hazy, only just seen f. glass.

Nov. 9.—Visible naked eye? nearly 6 mg.

Dec. 7.—Not quite so bright yet as 67 Ceti; visibility to naked eye still doubtful.

Dec. 15.—Perhaps slightly brighter than Dec. 7.

Jan. 15.—A marvellous change in one month, now a striking naked eye star = δ Ceti. Clouds again before time to examine other stars.

Jan. 16.—Mira brighter than δ = 4 mg.

Jan. 18.—Do. do.

U CETI.—Four observations, but owing to small alt., and frequent mist on horizon magnitude not properly estimated.

Compared with a 6.5 star between ε Ceti, and ρ Ceti.

Although not certainly identified Dec. 7 and Dec. 15, must have been less than 8 mg.

R CANCRI.—Not quite sure of the identification of this star, but purpose making more obs. if Feb. is not too late. Found a reddish star $2\frac{1}{2}^\circ$ N. of β Cancr. 8.5—9 mg. Dec. 15.

Est. mg. of comp. stars.

S

Est. $a = 6.5$

$b = 8$

$c = 8.5-9$

$d = 10$

$c = R?$

d

a

b
N

Observations of Variable Stars, 1894.

By HENRY CORDER, Bridgwater.

R Geminorum.—Invisible with 6½-in. for some time; December to March; 11 magnitude April 22, and last seen as 9 magnitude May 7; October 21, 10 magnitude, and invisible again December 31; 6 observations.

U Orionis.—Maximum for quite two weeks in middle of February, after a very rapid rise of 3½ magnitudes in January. When seen again in the middle of October it was about 11·5, and after reaching 10·75, remained at a standstill till the end of the year; 36 observations.

S Orionis.—Minimum in the summer. By end of December had risen to about 8·25, and appeared nearly stationary; 12 observations.

R Leporis.—Maximum of about 6·25 January 25. November 15 it was reckoned rising to 7·75; but to have fallen again to 8·5, at which it remained all December. From its deep red colour it is a difficult star to compare with the white stars near it; 12 observations.

S Virginis.—Maximum 8·25, May 22. Invisible in December; 11 observations.

S Cassiopeiæ.—Invisible all the spring. 10·5 end of July; rising to a maximum of 7·75 end of November; 20 observations.

R Cassiopeiæ.—A rapid rise of 3 magnitudes in June to a prolonged maximum in July and August. Reckoned brightest 5·8 magnitude July 31, but perhaps earlier; 25 observations.

T Cassiopeiæ.—Maximum 7·25, June 1, after a slow rise, the star having only varied 1 magnitude from January to May. It was considered invisible again for a short time about December 1; 21 observations.

R Andromedæ.—At maximum of 6·5 all through March. There was a rapid rise of 3 magnitudes in January, with a halt in February. It was at the limit of visibility in October—November; 25 observations.

R Aquilæ.—At minimum in January? when too near the sun. It rose quickly to a maximum of 6·5 about June 28, and had again fallen to about 11·25 by the end of December; 14 observations.

R Serpentis.—Invisible from April to June, rising to maximum of 7·5 October 22; 12 observations.

T Herculis.—Minimum, March 5, 12·5. Maximum, May 15, 9·25. Minimum, August 15, 12 magnitude. Maximum, November 30? 9 magnitude; 19 observations.

R Coronæ.—After being visible with the naked eye almost the whole of 1893, the star fell to 9 magnitude about March 7; then rose to a secondary maxima of about 7·25 on June 1. A rapid fall then took place to about 10·25 on August 1, when the star

again rose as quickly to 7 magnitude in September. At the end of the month it had fallen slightly, but at the end of the year it was again becoming visible with the naked eye; 23 observations.

S Coronæ.—Maximum of about 7.2, April 20; and invisible in the autumn; 13 observations.

R Ursæ Majoris.—At minimum of about 13 magnitude May 1. A rapid rise of 5 magnitudes in June—July brought the star to a maximum of 7.25, about August 1, when a steady fall took place to about 11.75 by December 31; 24 observations.

S Ursæ Majoris.—Minimum of 11.75, April 20; after its maximum at the end of 1893. It was at maximum again of 7.75, August 1, and at minimum 11.5, December 15; 27 observations.

T Ursæ Majoris.—After the maximum of December 1893 the star was reckoned at a minimum of 12.5 on April 1, and after a rapid rise of 5 magnitudes in June and July, was at a maximum of about 7 magnitudes, August 7; and by the end of the year was at the limit of visibility; 28 observations.

R Aurigæ; at a halt, about 9.75 in January, February, and early part of March, rising very slowly till April 7, when a quick rise of 2 magnitudes in April brought it to a maximum of 6.8 in the first week of May. By the end of October it was invisible to the end of year; 21 observations.

Mira, though a month past minimum on January 1, had hardly risen above 9 magnitude, but then rose quickly, and in February cleared 3 magnitudes, and when last seen on March 15 was slightly brighter than γ Ceti; about 2.85. It fell again to a minimum of 9.2 on November 5, nearly six weeks behind the time given in *Companion to Observatory*, the maximum also being quite a month late, as it probably was the year before; 22 observations.

R Leonis, at a minimum of about 10.5, January 7. For two months the rise was slow, and then quickly from March 25 to a maximum of only about 6.25 on May 7. It was considered to have fallen almost to 7 magnitude by the end of May, when it should have been at maximum by *C.O.* It was again at a minimum of 10.25, October 20; 23 observations.

R Hydræ.—Not seen till January 15, when it was apparently about at a maximum of 4.5, the date given in *C.O.* being more than four months earlier. The maximum may have been a prolonged one, but at any rate must have been after date. The star was followed to 9.5, near the end of May, but minimum was not seen. The star was again visible with the naked eye in December, being reckoned fully equal to ϕ Hydræ (? 5.25) by December 31, so that the maximum will again be later than calculated in all probability; 9 observations.

R Draconis.—Maximum of 7.25, January 21, or perhaps not till February 7. Minimum of about 13 magnitude, May 28, maximum of 7.5, September 21, which lasted with very slight diminution from about September 7 to November 15, when a rapid fall set in, reaching about 11.5 by December 31; 28 observations.

T Cephei.—Minimum of 11 magnitude, January 10, with a slow and unsteady rise till end of May, when it rose quickly to

6 magnitude by end of July, and was visible with the naked eye for about 10 weeks, with a maximum of 5·75 from August 21 to September 21; 31 observations.

R Cygni.—Invisible in January, February, and most of March, and then rose 6 magnitudes in three months; with a maximum of 7·5 about June 15? and a gradual fall to the limit of visibility by the end of the year; 23 observations.

U Cygni.—This star rose very slowly from November 30, 1893, till April 1894; the change hardly amounting to 1 magnitude. It was reckoned about 7·75 from March 7 to April 30, and then fell rather quickly till July 1, when it halted for a month; falling steadily again to about 11·75 by the end of October, remaining at that magnitude the rest of the year; 21 observations.

Z Cygni.—At minimum, probably limit of visibility, through February and March; rising rapidly through $3\frac{1}{2}$ magnitudes in April, and more slowly in May, to about 8·5 on June 1; after which it was not seen again till it was of 10 magnitude on August 1, so probably the maximum was in the middle of June, as given in *C.O.* From September 1 to December 20, it remained at the limit of visibility, but appeared to be rising again at the end of the month; 17 observations.

χ Cygni.—Fell quickly all the spring, to a minimum of 13 magnitude at the end of May, when it rose unsteadily to 10 magnitude on November 1. A very rapid rise then commenced of 5 magnitudes in six weeks; and the star was reckoned at a maximum of about 4·5 on December 15; 30 observations.

R Scuti.—April 1, 6 magnitude. May 21, 5·5. June 28, 5·5 (probably at maximum about June 10). Minimum of 7·25, August 7, and maximum of 4·8, September 21. Minimum of 6·2, October 21. Maximum of 4·8, November 16; and nearing minimum (6·7) on December 16, when last seen. It will be found that these maxima and minima occur at almost exactly opposite times to those given in *C.O.*; 22 observations.

R Aquarii.—About 7·3 at end of August, being then past a maximum; about 10 magnitude in November; 6 observations.

V Hydrae.—Very bright and red, March 27; seen again in December, and reckoned 8 magnitude.

R Crateris.—Observed occasionally, but not much change, if any.

A few of Mr. Espin's new stars are under observation.

Nova Aurigæ has been observed at times, but no change detected.

Bridgwater, January 1895.

OBSERVATIONS OF VARIABLE STARS, 1895.

By Henry Corder, Bridgwater.

	No. of Observation.	Maximum.	Magnitude.	Minimum.	Magnitude.	Remarks.
Mira	21	March 12	3.75	October 1	9.0	Rose very rapidly in January to a small maximum about February 7, with a subsequent greater rise. Not regularly observed.
S Ceti	6	October 21	7.5	—	—	
R Leporis	17	April 1?	6.8	October to January	8.5	Maximum came on when getting into twilight. Minimum very difficult to judge. Perhaps January 15, 1896.
S Orionis	16	January 1	8.25	—	—	Minimum when near sun. A distinct halt from October 15 to December 7.
W Orionis	28	March 1	6.3	October 1-25	12	A very rapid rise of 4 mags. in January after a month's halt in December 1894. A similar halt in December 1895.
R Aurigæ	26	August 24	7.5	—	—	No minimum in 1895. Quite stationary at 10 mag. from March 7 to June 1.
R Draconis	28	June 3	7.5	February 14 and October 21.	13-12.5	Remained but a short time at maximum.
R Arietis	18	April and October 15	8.0	January 20 and July	12	Summer maximum and minimum not observed.

—	No. of Obser- vation.	Maximum.	Magnitude.	Minimum.	Magnitude.	Remarks.
R Geminorum	20	June	—	Invisible from January 1 to April 15.	< 13	Minimum probably at least six weeks after predicted date. At time of predicted maximum in May it was only up to 10 magnitude.
R Leonis	26	March 14	5.0	September 15-30	10.2	A very bright sharply defined maxi- mum. At end of year perhaps at maximum again, but faint.
R Hydræ	8	February 2?	5.0	Minimum not observed		Maximum may have been a fortnight earlier. Too low for good obser- vation.
S Virginis	16	March 29	6.15	Invisible at beginning and end of year.		A very sharp and bright maximum after a rapid rise.
R Coronæ	29	5.8 to 6.0 from January 1 to June 25 and again from August 25 to September 25				Sharply defined and sudden minima on August 3 (9.5) and November 21.
S Coronæ	24	March 21	7.9	Invisible October 15 to ? end of year.		
R Serpentis	20	October 1?	7.0	Invisible during May and June		Stationary at maximum for about a month. September 15 to October 15.
T Cephei	22	October 15	6.0	March 20	10.75	Unlike most variables the fall seems more steady and quicker than the rise.
R Andromedæ	28	April 7?	5.7	December 15?	12	Rapid rise of 6 magnitudes in 3 first months, followed by steady fall.
χ Cygni	22	No maximum in 1895		August 25	Invis. ? 13.5	
R Cygni	30	August 7	6.7	Invisible from February 1 to April 3		Rise of 7 magnitudes in 4 months.

W Cygni	-	26	July 18?	7.85	At minimum from November 15 1894 to February 1, 1895, 12 mag. July 1? Invisible for several weeks	The spring maximum prolonged for 10 weeks, January 15 to April 1, but no maximum well defined.
Z Cygni	-	25	Feb. and Nov. 15.	8.75		
T Herculis	-	22	April 12. 7.5	October 7? 8.5	Jan., July and Dec. 12.	Minima not well observed. April maximum unusually bright.
R Scuti	-	30	Maxima almost exactly at predicted dates for minima and vice versa.			Alternate high and low minima like β Lyrae. Brightest, September 1, 4.9 mag. Lowest, October 15, 8 mag.
R Ursæ	-	31	June 4	7.0	Feb. 8, 12.75; and Dec. 16, 13.2	Rise of $5\frac{1}{2}$ mags. in 7 weeks. Nearly 3 mags. rise in April alone.
S Ursæ	-	31	March 21, 8.0; and November 7, 8.0		July 15? 12.0	
T Ursæ	-	30	May 7	7.75	Jan. 21? and Sept. 15? Invisible.	
R Cassiopeiæ	-	27	October 5?	6.3	April—May 11.5	A faint maximum this year.
S Cassiopeiæ	-	23	No maximum in 1895		Invis. from Sept. 1895 to Mar. 1896	A gradual fall from 8th magnitude on January 1 to invisibility.
T Cassiopeiæ	-	25	August 10?	7.7	No minimum in 1895	Very prolonged time of brightness. 8 mag. or above from March 15 to October 1.
R Aquilæ	-	21	May 21	7.3	December 7? 12.1	Rose 3 mags. in April.
R Aquarii	-	10	September 1?	6.9	Minimum not observed.	
T Aquarii	-	4	October 25-31?	7.8	Minimum not observed.	

Variable Star Observations, 1895.

By HENRY CORDER, Bridgwater.

R Cassiopeiæ.—Maximum October 3, magnitude 6·3. Minimum May 1, magnitude 11·5?

T Cassiopeiæ.—August 7, 7·75 very near 8th magnitude from February till September.

χ *Cygni*.—Invisible from August 1, to about September 20 (no maximum).

R Cygni.—August 5, 6·6, after a very rapid rise from invisibility on April 3. Minimum about March 1?

U Cygni.—July 23, 7·8, after a long period of faintness in the winter.

Z Cygni.—Rapid rise in January, with a fairly steady maximum of about 9·25 magnitude, lasting through February and March. Minimum 13th magnitude, June to August.

R Leonis.—March 11, 5th magnitude. A bright maximum. Minimum? September 20, 10th magnitude.

R Aquarii.—Maximum, 7th magnitude, September 1, or perhaps earlier.

T Aquarii.—First seen at about maximum on October 20, 7·8.

R Aquilæ.—May 20, 7·25. Minimum about December 10, 12·2.

R Ursæ Majoris.—June 3, 7th magnitude. Minimum February 7, 12·75, and December 15, 13·2.

S Ursæ Majoris.—March 21, 8th magnitude, and November 15, 8th magnitude. Minimum July 15, 12th magnitude.

T Ursæ Majoris.—May 10, 7·75. Invisible in January and again in September.

R Scuti.—Maxima January 25, April 8, July 2, September 1, November 28. Minima January 1, March 15, May 20, August 10, October 15, almost exactly the reverse of phases as given in *Companion to Observatory*. The light curve seems to resemble that of β Lyræ. The minima of January, May, and October, being from one to two magnitudes lower than the intermediate ones.

T Herculis.—Maxima April 12, 7·5; October 2, 8·5. Minima about January 15, ? 12th magnitude, July 15 and December 31.

R Andromedæ.—April 7, 5·8. Almost, or quite invisible in December and January 1896.

T Cephæi.—October 7, 6th magnitude. March 21, 10·75.

R Serpentis.—October 1, 7th magnitude. Invisible during May and June.

S Coronæ.—March 21, 7·9. Invisible October—December.

R Coronæ.—About 6th magnitude, January to June, then a sudden fall to 9·5 magnitude, August 3, and up again to 6th magnitude end of month and all September. Another fall to

about 9·5 at end of November, but up again to 6th magnitude by middle of January 1896. Exceedingly curious, with no apparent fixed period. Generally visible with naked eye during 1895.

S Virginis.—May 25, 6·2. After rapid rise.

R Hydræ.—February 1, 5 magnitude. Minimum not observed.

R Geminorum.—Invisible December to April 20. Rising rapidly until too near sun to observe.

R Arietis.—Maximum about April 20 not seen. Again 8th magnitude October 15. Minima 12 magnitude, January 16. Again about July 25 (not seen), and again, 13th magnitude, January 15, 1896.

R Draconis.—June 2, 7·5. Minima 13th magnitude, February 15, and 12·5 magnitude October 20.

R Aurigæ.—Stationary from March 7 to June 10; 10th magnitude. Maximum of 7·5, August 25. No minimum in 1895.

S Orionis.—Maximum 8·2, January 1. Minimum in summer. A stationary period, or even slight fall at about 11th magnitude, October 15 to December 7, when rising to the maximum of February 1896.

U Orionis.—Rapid rise of four magnitudes in January to maximum of 6·25, March 1. Minimum 12th magnitude during October. This star also appears to halt during the rise at about 11th magnitude for five or six weeks, and then to rise very quickly.

S Ceti.—Observed near, or at maximum 7·5, October 21.

Mira.—First maximum or halt about February 7, and further sharp rise to 3·5 magnitude on March 12. Minimum about October 1, but almost stationary at 9th magnitude for three months, August—October.

Stars observed, as far as possible, about twice in a month, or oftener, at critical periods. Instrument 6½-inch reflector and binocular.

Report on Variable Star Work, 1893-96.

By Lieut.-Colonel E. E. MARKWICK, F.R.A.S.

My principal work on variable stars from 1893, May, to 1896, April, has been—

- (1.) Observing certain established or suspected variable stars.
- (2.) A comparison of a zone of the heavens between the parallels of $27\frac{1}{2}^{\circ}$ and 45° S. declination, with the maps of the *Uranometria Argentina*.

As to (1), the greater part of the observations have been published from time to time, principally in the "English Mechanic" and the "Monthly Notices" of the Royal Astronomical Society. I append hereto some observations of a few variable stars specially selected by the Director.

As to (2), on arriving at Gibraltar in May 1893, and knowing I should probably be stationed there some years, I determined to attack the zone $27\frac{1}{2}^{\circ}$ to 45° S. Dec., using a binocular, and comparing the sky with the U.A. About one or two evenings per month were devoted to this. It was a somewhat rapid survey, which consisted in identifying the configuration of the stars as given in the maps, and in noting whether their relative apparent magnitudes agreed (or otherwise) with the maps.

Any stars not in the map which were considered fairly brighter than 7 m. (the limit of the U.A.) were noted for special subsequent observation, and any stars whose brightness was markedly discordant with that in the map or catalogue of U.A. were similarly noted.

This search has resulted in the discovery of 2 new variables, viz., T Centauri and A.G.C. 26,384. Both of these stars were independently discovered by Mrs. Fleming from the peculiarity of their photographic spectra. I also observed independently the star S Sculptoris, before I saw its announcement as a variable (see A.N., No. 3342, p. 93) and the star RR Sagittarii (see E.M. for 1895, November 15, letter 38,210).

I append a list of stars noted for special observation, viz., those which are not in U.A., although above 7 m., and those whose brightness is discordant with that in the U.A., with brief notes of the observations which have been made. Though suspicious, I think the majority of these stars are most probably not variable, while there are a few which may turn out slightly variable, viz., Nos. 4, 14 or 15, 20, 42, 44, 45, 46, 48, 50, 53, 54, 64, and 69.

My astronomical library being somewhat limited here, I am indebted to the kindness of Prof. Pickering, Mr. Gore, and Prof. Pereira for much help in identification.

In the list where no U.A. member is given in second column, it is implied that the star is not in that catalogue.

S Ceti.—I am doubtful of the identification of this star. Fig. 12 shows its position on scale of U.A.

Fig. 11 shows view in telescope, power 28.

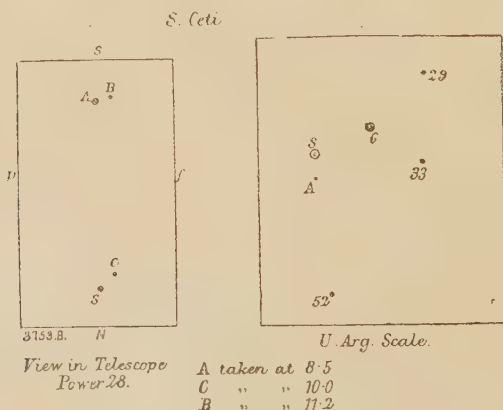


FIG. 11.

FIG. 12.

If the star marked S in Fig. 1 is really the variable, then the observations are as follow, using the comparison stars, magnitudes as given :—

1895—Dec. 6	8.5	1895—Dec. 19	8.4	1896—Jan. 15	8.0
8	8.4	20	8.0	16	9
12	8.4	1896—Jan. 9	8.7	Feb. 8	8.2

R Arietis.—I began observing this star too late, and no deduction as to date of maximum can be inferred.

Oct. 16	10	Nov. 7	10.2	Nov. 23	11.4
21	10	9	10.2	Dec. 6	12
27	10	12	10.5	16	12
Nov. 4	<10	14	11	20	Inv. in
5	10.2	21	11.2	1896—Jan. 9	tel.

U Ceti.—I have not succeeded in identifying the star this season. It would be apparently somewhere in or near the pencil circle, but I see no stars there in $2\frac{3}{4}$ in.

Looked for on 13 dates between 1895, November 9, and 1896, March 3.

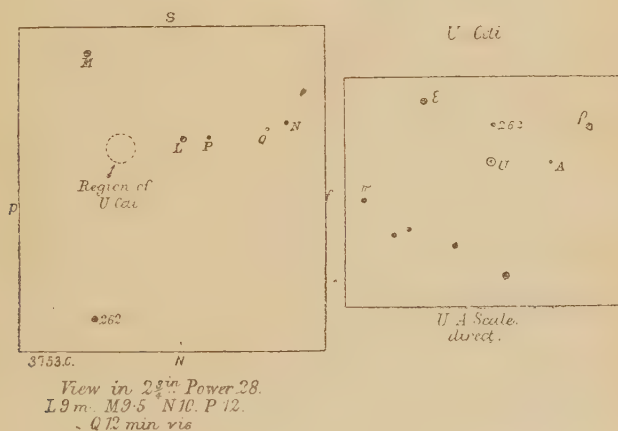


FIG. 13.

FIG. 14.

U Monocerotis.—The observations exhibit curious fluctuations of light, and it is impossible to make them accord with any typical light curve. However, a maximum seems indicated close to March 11 (the calculated date), and a well-defined minimum also occurs very close to calculation (April 25). Observations:—

1896—Feb. 7	6.2	1896—Mar. 12	6.1	1896—Apr. 3	7.1
8	6.35	16	6.35	9	7.15
20	6.2	17	6.2	1	7.0
22	6.4	19	6.55	3	6.9
Mar. 9	6.1	20	6.25		
10	6.3	Apr. 2	7.0		

R Cancr..—I was unable to identify this variable.

LIST OF SUSPECTED STARS.

No.	Identification.	Position (1900).		Photometric Magnitudes.	Observations at Gibraltar.
		R.A.	S. Dec.		
1	κ_1 Sculptoris, 5'5 U.A.	h m 0 4'3	28 33	κ_1 is some- times a little brighter and sometimes fainter than κ_2 .	Generally κ_1 a little brighter than κ_2 , ex- cept once on Dec. 17, 1894, when it was fainter.
2	κ_2 Sculptoris, 5'4 U.A.	0 6'4	28 21		
3	C.D.M. 35° 36, 7'2	0 5'7	35 27	7'06 and 6'88 in 1893.	6'7 to 7'1.
4	In A.G.C. 7½, C.D.M. 6'7.	0 35'0	34 31	6'48 to 6'77 in 1893.	6'5 to 6'9. Suspected of variability by Thome.
5	λ_1 Sculptoris 6'0 U.A.	0 37'9	39 1	λ_1 sometimes a little brighter and sometimes fainter than λ_2 .	Doubtful. Sometimes one, sometimes the other, the brighter.
	λ_2 Sculptoris 5'8 U.A.	0 39'4	38 59		
7	—	1 30'2	28 10	—	6'8 to 7'2.
8	—	1 38 (approx.)	29 4	—	Usually about 6'7 or 6'9.
9	—	1 54 (approx.)	36 38	—	6'7 to 7'0.
10	—	2 9 (approx.)	35 13	—	6'8 to 7'1.
11	—	2 5 (approx.)	28 48	—	6'8 to 7'0.
12	38 U.A. Fornacis 6'4, 7'3.	2 34'4	38 25	6'25 and 6'45 1893.	40 estimated sometimes ½ mag. > 38; and some- times only 4 steps greater.
13	40 U.A. Fornacis 6'1.	2 38'1	38 49	5'49 to 5'90 in 1889 and 1893.	
14	C.D.M. — 28° 87'0, 7'2.	2 38'5	28 35	6'95 in 1893; 6'94 in 1894.	It looks as if one of these stars were slightly variable. No. 15 is generally about 7½ or 8 m.— considerably below limit of U.A. While No. 14 ranges between 6'5 and 7.
15	41 U.A. Fornacis 7'0.	2 39'4	28 20	7'78 in 1893; 7'48 in 1894.	
16	45 U.A. Fornacis 6'8.	2 40'2	36 43	—	I make this star a little below 7 m.
17	C.D.M. — 31° 13'05 7'4.	3 12'8	31 43	7'02 and 6'76 in 1894.	6'75 to 7'0. 9 observa- tions, 1894-96.
18	—	3 36 (approx.)	29 1	—	Generally seen as a fair 7 m.
19	—	4 45 (approx.)	34 34	—	6'8 to 6'95.
20	C.D.M. — 32° 22'42 7'5.	5 12'6	32 37	7'02, 1894; 7'07, 1895.	6'8 to 7'3 in 1894-96. Probably slightly vari- able.
21	—	5 53'9	44 2	—	6'75 to 7'0 in 1894, 1895, and 1896.
22	83 U.A. Columbae 6'8.	6 9'1	36 32	6'86, 6'73 in 1894.	Generally estimated a little fainter than 7 m.

No.	Identification.	Position (1900).		Photometric Magnitudes.	Observations at Gibraltar.
		R.A.	S. Dec.		
23	—	h m 6 12 (approx.)	° 29 40	—	Generally 7 ^o m.
24	—	6 20 (approx.)	36 56	—	Do.
25	—	6 22.6	40 55	—	6.5 to 7 ^o .
26	110 U.A. Canis Majoris.	6 55.2	32 35	7 ^o 05 and 6 ^o 78 in 1894 and 1895.	Generally about 7 ^o 3. Decidedly below the limit of the U.A.
27	—	7 20 (approx.)	36 9	—	About 6 ^o 9.
28	—	7 24 (approx.)	34 8	—	Generally 7 ^o 0 m., or thereabouts.
29	—	7 28 (approx.)	36 1	—	Generally 6 ^o 6.
30	219 U.A. Puppis 7 ^o .	7 50.7	31 19	—	Estimated variously 10 ^o 25 to 10 ^o 8 in March and April 1896. There is probably some confusion in the U.A. between this and No. 31.
31	L. 3061, 7 ^o 4 U.A.	7 50.9	31 13	—	7 to 7 ^o 4. Many observations.
32	A.G.C. 10415, 8 m. C.D.M. 7 ^o . Z.C. { 7 ^o . { 6 ^o 5. { 7.	7 51.3	30 39	7 ^o 9 to 8 ^o 4 in 1889, 1893, 1894, and 1895.	Generally 6 ^o 5, sometimes 7 ^o 0. 40 observations. [Photographic 7 ^o 9 to 8 ^o 4 in 1889, 1893, 1894, and 1895.]
33	—	7 55 (approx.)	40 26	—	A little above and below 7 m.
34	273 U.A. Puppis 7 ^o 1.	8 9.7	31 26	6 ^o 68 and 6 ^o 80 in 1895.	{ No. 35 is brighter than 34 by an amount varying from 0.5 to 1.0 m. 35 now (April 1896), probably quite ½ mag. brighter than U.A. gives it. }
35	275 U.A. Puppis 6 ^o 7.	8 10.2	31 50	5 ^o 85 and 6 ^o 08 in 1895.	
36	37 U.A. Pyxidis 7 ^o .	8 46.5	35 34	6 ^o 82 and 6 ^o 76 in 1894.	{ I generally make No. 37, ½ a mag. > 36. }
37	39 U.A. Pyxidis 7 ^o (var.).	8 48.8	36 10	6 ^o 10 and 6 ^o 60, 1894; 6 ^o 28 (bis), 1895.	
38	—	8 47.8	42 8	—	6 ^o 7. Only one observation.
39	—	8 52 (approx.)	36 43	—	6 ^o 9 to 7 ^o 4. Usually about 7 ^o .
40	—	9 42.2	30 49	—	6 ^o 85 to 7 ^o 2.
41	—	10 16 (approx.)	30 58	—	7 to 7 ^o 4.
42	A.G.C. 14, 287, 7	10 23.5	43 50	—	In 1894 about 7 ^o 3. In 1895, 7 ^o 55. Possibly slightly variable. [Photographic 7 ^o 5 in 1893, 1894, and 1895.]
43	—	10 39 (approx.)	31 37	—	Generally about 7 ^o 0 m. in 1894 and 1895.

No.	Identification.	Position (1900).		Photometric Magnitudes.	Observations at Gibraltar.
		R.A.	S. Dec.		
44	234 U.A. Velorum 7 ^o . = Lac. 4503, 7 m. = Yarnall 4643, 7 ^o . = A.G.C. 14° 885, 7 ^o .	h m 10 48 ^o 5	39 53 39 53	7 ^o 80, 20 ^o 1, 1890; 8 ^o 08, 9 ^o 4, 1891; 7 ^o 26, 2 ^o 4, 1894; 7 ^o 75, 30 ^o 3, 1895.	Always seen in 1894-95 as 8 ^o 5 m., and perhaps a little fainter at times. If magnitudes in for- mer catalogues are correct the star must have varied since. The photographic mag. is 7 ^o 6 in 1894 and 1895. There is a 9 m. pre. 22 S. and 4 ^o 3 South, approxi- mately.
45	C.D.M. - 37° 7146 6 ^o 6 = A.G.C. 14° 448 6 ^o 6.	11 12 ^o 4	37 28	6 ^o 30 and 6 ^o 34 in 1894.	About 6 m. on six occa- sions in 1894, 1895, and 1896. It is curious this star should have been omitted from U.A. 20, U.A. Centauri, 6 ^o 6 m., which is closely S., is probably rated too high; it is nearer 7 m.
46	329 U.A. Hydræ, 6 ^o 4 = A.G.C. 17° 216 6 ^o 4.	12 33 ^o 6	29 52	5 ^o 76 to 6 ^o 28 in 1890, 1891, 1893, 1894, and 1895.	5 ^o 3 to 6 ^o 4 in 1894, 1895, and 1896. Possibly slightly variable. Pho- tographic mags. 7 ^o 0, four times, and 7 ^o 3 once, in 1893-95.
47	C.D.M. - 35° 8459 7 ^o 1.	13 2 ^o 8	35 41	6 ^o 81, 6 ^o 68, in 1895.	6 ^o 6 to 7 ^o 0.
48	359 U.A. Hydræ, 6 ^o 5.	13 44 ^o 4	28 35	6 ^o 27 . -	The U.A. makes this star same brightness as No. 361. My observa- tions give it from 5 ^o 5 to 6 ^o 6. Prof. Pereira finds it in various cata- logues, 5 ^o 5 to 7 ^o 2. The star is therefore proba- bly variable to a slight extent.
49	—	13 49 (Approx.)	28 15	—	6 ^o 6 to 7 ^o 5. Almost due S. of 361 U.A. Hydræ.
50	—	13 50 ^o 1	30 4	7 ^o 28, 6 ^o 98, in 1889.	6 ^o 9 in 1893, low, 7 m. in 1894. Not noted specially when observ- ing this part of the sky on 1895, May 21, and therefore possibly slightly variable.
51	—	14 20 ^o 5	32 48	7 ^o 04 in 1895 -	7 ^o 0 to 7 ^o 5.
52	381 U.A. Centauri, 5 ^o S.	14 49 ^o 6	33 27	5 ^o 11 to 5 ^o 65 in 1889, 1892, 1893, and 1895.	5 ^o 1 to 5 ^o 4. It is 6 ^o 1 on five Harvard photo- graphic plates in 1892, 1893, 1894, and 1895.
53	136 U.A. Lupi, 7 ^o 0	15 49 ^o 4	35 23	7 ^o 88 and 7 ^o 89 in 1889.	I always make this star about 8 ^o 5 or 9 ^o 0; almost <i>min. vis.</i> in binocular; far below the 7 ^o 0 of U.A.
54	A.G.C. 21° 644, 7 ^o 2	15 53 ^o 2	40 22	6 ^o 08 in 1889, 6 ^o 47 in 1890.	6 ^o 8 to 7 ^o 6. Perhaps variable. [Harvard photographic mag. about 8 ^o 4 in 1891, 1893, and 1894.]
55	—	16 9 (Approx.)	31 19	—	15 observations in 1893- 94 make it about 7 m.

No.	Identification.	Position (1900).		Photometric Magnitudes.	Observations at Gibraltar.
		R.A.	S. Dec.		
56	Z.C. 2683 7 ^s 5	^h 16 ^m 40 ^s 2	[°] 39 ["] 21	—	Estimated 7 m. once; five times fainter than 7 m.
57	109 U.A. Scorpii, 7 ^s 0, 7 m. Lc. 7 m. Stone. Cord. Zone, 7 ^s 0.	16 49 ^s 0	32 21	—	30 observations in 1894-95, make it not above 7 ^s 5 m., but do not indicate change. Roberts made it 7 ^s 2 or 7 ^s 3 in 1894.
58	—	18 23 (Approx.)	38 57	—	Fair, 7 m.
59	—	18 27 ^s 1 (Approx.)	24 11	—	Usually 7 m.
60	—	18 28 ^s 4	24 18	—	This star generally appears 6 ^s 5 or thereabouts; 34 observations.
61	—	18 33 (Approx.)	30 6	—	6 ^s 85 to 7 ^s 1.
62	167 U.A. Sagittarii, 6 ^s 7.	19 15 ^s 1	42 18	—	6 ^s 7 to 7 ^s 5.
63	—	19 16 ^s 0	32 16	—	6 ^s 9 once, other occasions a little below 7.
64	291 U.A. Sagittarii, 7 ^s 0 var.=A.G.C. 27 ^s 0 862, 7 ^s 0.	20 15 ^s 1	41 4	8 m. in 1893, 1894, and 1895.	7 ^s 3 to 8 in 1894-95. [Photographic about 8 m. in 1893, 1894, and 1895.]
65	24 U.A. Microscopii, 6 ^s 8.	20 40 ^s 0	36 29	—	6 ^s 6 to 7 ^s 5.
66	1 U.A. Gruis, 6 ^s 9.	21 24 ^s 8	36 59	—	About 7 ^s 3 to 8.
67	—	21 46 ^s 2	41 53	—	6 ^s 8 to 7 ^s 3; 22 observations.
68	A.G.C. 30 ^s 57 ^s 0 7 ^s 2 = Z.C. 526 ¹ / ₇ 7 ^s 5	22 18 ^s 7	39 38	6 ^s 74 to 7 ^s 18, 1890, 1892, and 1894.	Usually 6 ^s 5 or 6 ^s 6. Extremes, 6 ^s 35 and 6 ^s 9. [Harvard photographic mag. 5 ^s 9 in 1891, 1893, and 1895.]
69	The second star of Group 44 U.A. Piscis Australis, 7 ^s 5.	22 26 ^s 6	35 53	7 ^s 80 to 8 ^s 10 in 1894.	Not usually visible in binocular. In telescope, about 8 ^s m.
70	—	22 41 (Approx.)	42 8	—	6 ^s 65 to 7 ^s 0; 9 observations in 1893.
71	69 U.A. Gruis, 5 ^s 8 r.	22 45 ^s 3	39 41	4 ^s 98 to 5 ^s 64 in 1889, 1892, 1893, and 1894.	5 ^s 3 to 5 ^s 8; usually the former.
72	61 U.A. Piscis Australis, 7 ^s 0.	22 46 ^s 1	36 25	—	7 ^s 1 to 7 ^s 7, 1894-95.

PLATE II.

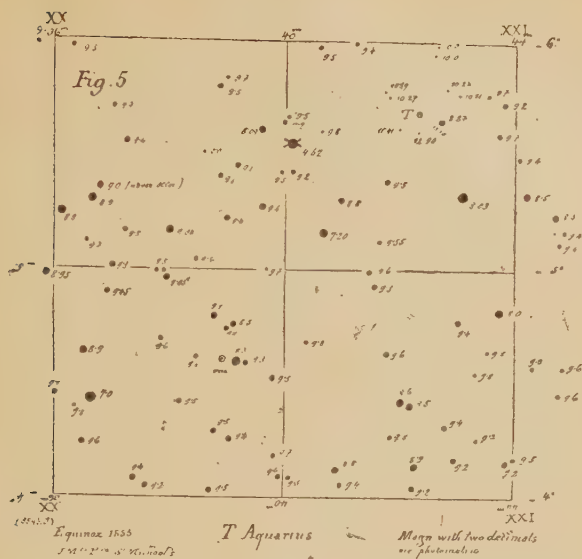
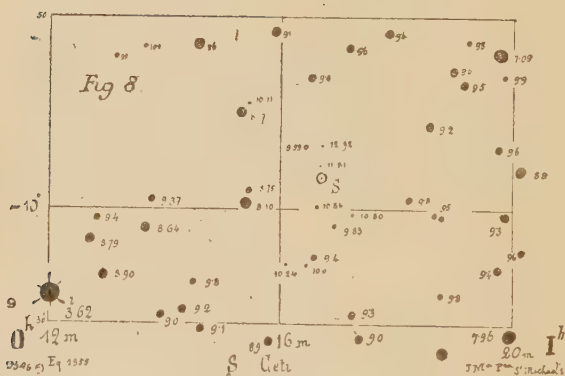
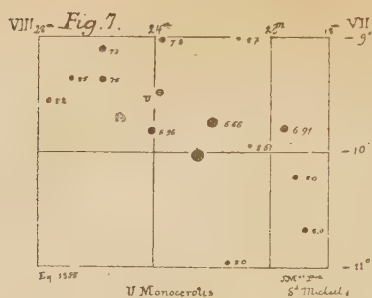


PLATE III.



Remarks by the Director.

It will be noticed in the preceding observations that in some cases the same star has been observed by more than one observer. The following summary of these observations may be useful:—

S Ceti.—Maxima observed by Prof. Pereira about October 23, 1895 (7·6 mag.); and by Corder, 1895, October 21 (7·5 mag.). Col. Markwick's observations do not agree with Prof. Pereira's, so that probably he did not identify the star. Dr. Chandler's elements give a maximum on October 23, 1895, so that probably the star was correctly identified by Corder and Pereira. Wood's observations agree.

T Cassiopeiæ.—Corder and Pereira agree in fixing a maximum about the middle of August 1895. Chandler's elements give a maximum for August 12, 1895.

Mira Ceti.—Prof. Pereira's observations show maxima about March 5, 1894, and 1895, February 18. Corder's observations give 1894, March 12, and 1895, between February 7 and March 12. This star has been late at maximum in recent years.

R Leporis.—Pereira's observations show a maximum about January 20, 1894, and Corder's on January 25, 1894. Chandler's elements give a maximum for January 10, 1894, but there is a "periodical inequality."

U Orionis.—Maxima observed by Pereira about February 9, 1894 (6·4 mag.) and 1895, March 11 (6·4 mag.); and by Corder 1894, middle of February, and 1895, March 1 (6·25 mag.). Chandler's elements give maxima 1894, February 17, and 1895, February 27.

R Leonis.—Maxima observed by Pereira about 1894, May 9 (6·4 mag.), and 1895, March 27 (5·2 mag.); and by Corder, 1894, May 7, and 1895, March 14 (5·0 mag.). There is a striking discrepancy between Corder's observation of a minimum, 1894, October 20 (10·25 mag.), and Pereira's observation on October 26, 1894, which makes the star 6·3 mag. Chandler's elements indicate maxima, 1894, May 6, and 1895, March 15, so that the observations of maximum agree closely with calculation.

R Ursæ Majoris.—Pereira's observations indicate maxima about 1894, August 6 (7·6 mag.) and 1895, June 15 (7·7 mag.); and Corder's about 1894, August 1 (7·25 mag.) and 1895, June 4 (7·0 mag.); and minima (Corder) 1895, February 8 (12·75 mag.), and December 16 (13·2 mag.). Chandler's elements give maxima 1894, August 1, and 1895, June 8, so that here again observation and calculation are in close agreement.

T Ursæ Majoris.—Maxima about 1894, August 6 (7·4 mag.) (Pereira) and 1894, August 7 (7 mag.) (Corder). Chandler's elements give a maximum 1894, August 12.

S Ursæ Majoris.—Maxima (Pereira) about 1894, August 25 (7·7 mag.) and 1895, March 3 (7·8 mag.); and Corder, 1894, August 1 (7·75 mag.) and 1895, March 21 (8·0 mag.), and November 7 (8·0 mag.). Chandler's elements give 1894, August 9, 1895, March 20 and October 28.

R Hydræ.—Maxima are indicated about 1895, January 18 (5.0 mag.) by Pereira's observations, and 1895, February 2? (5.0 mag.) ("maximum may have been a fortnight earlier") by Corder. According to Chandler's elements ("Third Catalogue of Variable Stars") a maximum was due on December 30, 1894, so that the maximum was apparently a little late.

R Scuti.—Pereira's observations indicate the following maxima: 1894, May 14—June 21, September 10, November 7; 1895, July 13, September 1, November 30, and minima 1894, August 2, October 18; 1895, October 5—13. Corder's observations show a maxima 1894, June 10, November 16; 1895, January 25, April 8, July 2, September 1, and November 28; and minima 1894, August 7, October 21; 1895 January 1, March 15, May 20, August 10, and October 15. The observations of the two observers are fairly accordant.

χ Cygni.—Maximum, 1894, December 26 (4.2 mag.) (Pereira), and 1894, December 15 (4.5 mag.) Corder. Chandler's elements give a maximum 1894, December 3.

T Cephei.—Maxima are indicated by Pereira's observations 1894, August 25—September 19 (5.5 mag.), and 1895, June 15 (5.2 mag.); and by Corder's 1894, August 21—Sept. 2 (5.75 mag.), and 1895, October 15 (6.0 mag.), with minima 1894, January 20 (11 mag.) and 1895, March 20 (10.75 mag.). Chandler's elements give maxima 1894, September 27, and 1895, October 19, so that Prof. Pereira's observation of 5.2 mag. on June 15, 1895, must be a mistake.

R Cassiopeiæ.—Pereira's observations show maxima about 1894, August 6 (5.6 mag.), 1895, October 13 (6.1 mag.); and Corder's 1894, July 31 (5.8 mag.), "but perhaps earlier," and 1895, October 5? (6.3 mag.). Chandler's elements give 1894, July 10, and 1895, September 10.

J. E. GORE,
Director of the Section.

SECTION FOR THE OBSERVATION

OF

J U P I T E R.

DIRECTOR.—REV. W. R. WAUGH, F.R.A.S.

FIFTH REPORT OF THE SECTION.

REPORT FOR THE APPARITION OF 1895 AND 1896.

PART 1.

The following Table gives the names of the registered Members of the Section, the localities of observation, the number of drawings forwarded to the Director, the inclusive dates of the drawings, and the instruments used. As heretofore, in this Table, all the drawings that have come to hand are accounted for. At the request of the Council 12 representative drawings were sent through the "Astronomical Society of Wales" to the Cardiff Exhibition. A few, by permission of the Members, are retained by the Director for the purpose of detecting cyclical changes. Several of the Director's have been used as specimens of work, and sent to the new Members for their instruction in the art of planetary drawing. Others have been retained, by consent of the observers, by the Director for special reasons not necessary to be indicated in this report. Nearly all those Members who have not returned drawings have, by satellite observations, or in some other way, contributed to the general work. The total number of drawings to hand is 251. Of these 30 have been selected by the Director for reproduction in the Memoir. The remainder, allowing for the foregoing deductions, are affixed in a suitable album (the gift of one of the Members), and will be in circulation among those Members who intimate a desire to see it, and finally deposited in the Library of the Association for future reference.

Name,	Locality.	No. of Drawings.	Instrument.
WM. ANDERSON - -	Madeira - -	11	5-in. spec.
E. M. ANTONIADI - -	Paris - -	6	4½ and 9½ in. O.G.
E. G. AYLETT - -	Bredgar - -	—	8½-in. spec.
Rev. J. BAIKIE - -	Ancrum - -	—	3½-in. O.G.
LEO BRENNER - -	Lussimpiccolo - -	1	7-in. O.G.
G. L. BROWN - -	Stirling - -	—	—
R. W. BUTTEMER - -	Godalming - -	3	9½-in. spec.
B. E. CAMMELL, F.R.A.S. - -	Wokingham - -	—	—
J. E. CLARK, B.A., BSc. - -	York - -	—	—
E. J. COPE - -	Malvern - -	2	8½-in. spec.
H. CORDER - -	Bridgwater - -	6	6½-in. spec.
A. COTTAM, F.R.A.S. - -	Watford - -	—	—
Rev. Dr. CRAIG, F.R.A.S. - -	Londonderry - -	—	—
R. CROSS - -	Oxford - -	—	—
G. T. DAVIS - -	Reading - -	12	3¾-in. O.G.
F. W. ELLERBECK, F.R.A.S. - -	Scarborough - -	6	6·9-in. spec.
H. ELLIS - -	Potter's Bar - -	9	6-in. O.G.
E. ESSAM - -	Billingboro' - -	2	—
J. EVERSHED, F.R.A.S. - -	Kenley - -	—	—
R. FALCON - -	Workington - -	—	—
Rev. T. H. FOULKES, M.A. - -	Devonport - -	5	10½-in. spec.
A. FREEMAN - -	Hastings - -	2	10¼-in. spec.
W. GOODACRE, F.R.A.S. - -	Crouch End - -	4	12¼-in. spec.
H. F. GRIFFITHS - -	Streatham - -	51	6½-in. spec.
E. HALL - -	Finland - -	4	5-in. spec.
G. P. B. HALLOWES, F.R.A.S. - -	Brough - -	—	—
A. HENDERSON - -	Liverpool - -	—	—
E. R. HICKS - -	Kensington - -	—	—
Rev. R. S. HUTCHINGS, F.R.A.S. - -	Alderbury - -	—	—
W. H. IZZARD - -	Brentford - -	—	—
J. JACKSON - -	Blackpool - -	—	—
W. E. JACKSON, F.R.A.S. - -	Constantinople - -	—	—
Rev. S. J. JOHNSON, F.R.A.S. - -	Melplash - -	—	—
Rev. P. H. KEMPTHORNE, F.R.A.S. - -	Wellington College. - -	—	—
N. LATTEY - -	Cardiff - -	—	8½-in. spec.
J. LUNT, B.Sc. - -	Ealing - -	2	3¼-in. O.G.
Hy. MACEWEN, F.R.A.S. - -	Glasgow - -	26	5-in. O.G.
Dr. MAINS - -	Portland - -	—	—
W. H. MAW, F.R.A.S. - -	Kensington - -	4	6-in. O.G.
J. W. MEARES, F.R.A.S. - -	Brighton - -	3	—
A. MEE, F.R.A.S. - -	Cardiff - -	11	8½-in. spec.
F. R. MELLOR - -	Huddersfield - -	—	5-in. O.G.
Lieut. S. B. MOLESWORTH - -	Bexley - -	—	—
J. M. OFFORD, F.R.Met.S. - -	Ealing - -	7	12¼-in. spec.
J. ORR - -	Glasgow - -	2	—
Rev. J. D. PARKER, LL.D., F.R.A.S. - -	Stevenage - -	—	—
Dr. G. PATTERSON - -	Ascot - -	—	—
J. PHILLIPS - -	Hereford - -	—	—
Rev. T. E. R. PHILLIPS - -	Yeovil - -	—	9-in. spec.
Rev. V. REID - -	Glasgow - -	—	—
C. ROBERTS, F.R.A.S. - -	Aberdeen - -	35	6½-in. spec.
Dr. R. J. RYLE, M.A. - -	Hadley - -	—	—
Rev. B. SAUL - -	Weston-super-Mare. - -	—	—
Dr. SMART, F.R.A.S. - -	Bermondsey - -	4	10½-in. spec.
HAROLD SMITH - -	Luton - -	—	3½-in. O.G.

Name.	Locality.	No. of Drawings.	Instrument.
W. C. STEWART - -	York - -	—	—
C. A. TAYLOR - -	Kensington - -	—	—
Rev. W. R. WAUGH, F.R.A.S.	Portland - -	18	4½-in. O.G. 12½-in. spec.
A. STANLEY WILLIAMS, F.R.A.S.	Brighton - -	—	—
Rev. L. A. WILLIAMS - -	Brighton - -	—	—
J. WYKES - -	Bournbrook - -	7	4½-in. O.G.

Nearly all the drawings made during this apparition are on Green's forms, the use of which has been now fairly mastered by observers. Special attention has been paid to colouration, and it is thought by the majority of the sectional observers that tints have been unusually marked both in the bands and spots, with the exception of the Great Red Spot, which has decidedly faded, though some have thought that at given dates it tended to recover its pinkish tint. An inspection of the album, and of the reproduced drawings, will show that there is a decided improvement in accuracy and in the naturalness of the delineations.

Special attention has been paid to the latitude and longitude of the markings.

The interim reports that have appeared in the "Journal," though not so numerous as heretofore, show that the several members are fully aware of the advantages of serial reports, especially as the "Memoir" is necessarily delayed in publication.

Again the Director has to regret the great atmospheric hindrances to observation in the earlier portion of the apparition, showing still more emphatically the need of using every available opportunity for observation, continuity in which is an important element in success. Several of the Members have been very methodic and persevering, as their personal reports abundantly show. It is a matter of regret that these more detailed accounts of what has been done cannot be published in full owing to the want of sufficient funds. If printed in their entirety they would swell the "Memoir" more than fourfold. Five charts have been sent in, showing that this excellent mode of recording observations is finding favour.

The longitude and latitude of spots and markings have been carefully tested, and in the majority of instances found fairly correct, and it is satisfactory to note that Dr. Marth has applied to the Director for elements of prominent spots as data in the preparation of his most valuable Ephemerides of the planet; an authoritative testimony to the value of the work of the Section which is most encouraging, and should prove a stimulus to still further accuracy. As on previous occasions, the Director would most cheerfully record his indebtedness to Dr. Marth for his Ephemerides, and his thanks to all the diligent workers in the Section.

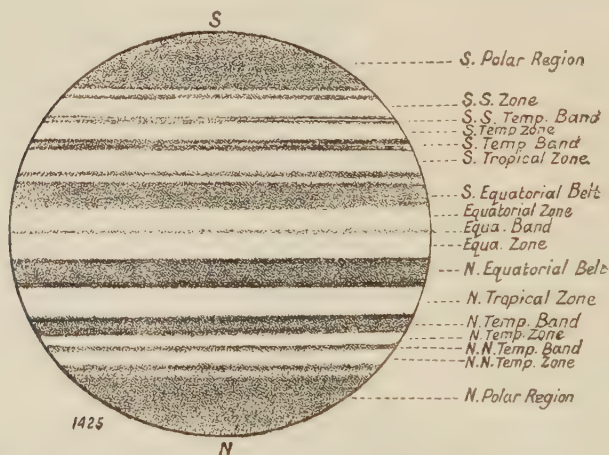
As on previous occasions, this condensed Memoir is divided into four parts: the first being introductory; the second brief descriptions of work on the surface of the planet, with a

description of the charts to hand; the third a record of satellite phenomena as observed by those who have paid special attention to this department, and also some measures of the belts; the fourth is a general résumé and discussion of the entire work. One special phenomenon, the occultation of Jupiter on June 14, is included in the first, the introductory part.

As the New South Wales Branch intend organising sectional work, it is thought desirable to omit the names of those who were in the Jovian Section, resident within the area of operation, as facilities for direction are somewhat difficult at the Antipodes.

The nomenclature diagram, which has appeared before, is here reinserted for facility of reference, and to promote its more general adoption by kindred societies, the new Members (of whom there are several) requiring it.

Several Members of the Section are taking practical interest in the cyclical work, as suggested by Capt. Noble. Some papers have been written on the subject, and more are in progress. Drawings also are being reproduced to a uniform scale, which will be arranged chronologically; in a few cases of considerably anterior date. Though necessarily slow, decided advance has been made, and it is hoped at the end of the current apparition sufficient material will be accumulated to justify preliminary discussion. The Director would make a fresh appeal to those interested for relevant data of any period, also for suggestive papers, some of which have already appeared in the "Journal."



Drawings of any date prior to the first decided record of the Great Red Spot will be especially valued, and will be returned, if desired, after reproduction to the uniform scale.

OCCULTATION OF JUPITER BY THE MOON ON JUNE 14, 1896.

From the reports that have come to hand of this interesting phenomenon we select the following:—

T. K. Mellor, F.R.A.S., writes from Huddersfield: "The occultation of Jupiter by the moon was well seen here, the sky being almost cloudless after an intensely hot day. The local time of the immersion at centre of planet was $9^h 47^m 40^s$,

“ the longitude of locality being $1^{\circ} 48'$ W., or $7^m 12^s$ behind Greenwich. The planet was about a minute in being hid from first contact. The emersion was hidden by buildings. The disk of Jupiter was paler than the moon.”

Mr. Thomas Radmore, of Portsmouth, writes: “ Instrument $3\frac{1}{2}$ -in. O.G. Occultation of Satellite IV. $9^h 45^m$ (very faint), first contact with Jupiter's disk, $9^h 54^m$, last contact, $9^h 55^m$. Satellite I. occulted, $9^h 57^m$; II., $9^h 58^m$; III., 10^h . Definition varied during phenomenon. The greater brightness of Satellite III. was unusually marked, which the Director can confirm.”

J. W. Meares, F.R.A.S., reports from Shrewsbury, “ that the first contact was at $9^h 51^m$, the internal contact at $9^h 57^m 48^s$. That the planet was wholly invisible for $41^m 55^s$. At the reappearance the internal contact was about $10^h 42^m 43^s$, the external $10^h 43^m 21^s$. Owing to the low altitude these latter times are necessarily approximate. Time corrected for 23^s error of watch.”

Other data, including the Director's, when co-ordinates are allowed for, confirm the above.

The Rev. S. J. Johnson reports as follows: “ After a hot day, with distant thunder, the sky near the western horizon was naturally a little hazy. The planet gradually approached the lunar disk like a golden ball, but of a brighter yellow than the moon. The contact of limbs seemed to occur at $9^h 53^m 59^s$ (time by sextant), and at $9^h 54^m 49^s$. Jupiter had wholly sunk behind the moon. There was no advantage in applying a higher magnifying power than 50 on the $3\frac{3}{4}$ -in. At $9^h 57^m 3^s$ Satellite I. was occulted, at $9^h 57^m 37^s$ Satellite II., at $10^h 0^m 2^s$ Satellite III. These phenomena were not very instantaneous. I watched the moon go below some distant ground at $10^h 44^m$. This must have been within a minute or so of the emersion. I would remark that this occultation is in some respects the most remarkable of the century; on no other occasion has the crescent of the moon been so attenuated, only $3\frac{1}{2}$ days old, the nearest approach to this having been on February 8, 1810, and on April 5, 1854, while all the occultations of Venus are in daylight.”

Mr. J. Wykes reports that he had an excellent observation of the occultation, the air being unusually clear and steady. Satellite IV. was hid at $9^h 39^m 30^s$, the body of the planet at $9^h 51^m$, 1st contact. When fairly behind the moon it showed up its uneven limb very plainly. Satellite I. was hid $9^h 54^m$, Satellite II. at $9^h 55^m$, Satellite III. at $9^h 57^m 30^s$. The reappearance was hidden by buildings. The apparent rapid motion of the moon was very marked, due doubtless to the phenomena of quickly passing in succession several bright objects. All the satellites seemed brighter than the moon.

PART 2.

The most notable features of the planet's disk during the apparition of 1895-96 are as follows:—

1. The darkening of the northern portion of the equatorial zone, which occasionally became so definite as to appear a supplemental band to the N. equatorial belt.
2. The gradual shrinking of the N. equatorial belt in its northern portion chiefly, so as to diminish the latitude of the belt fully 3° . This shrinkage was not exactly a condensation, but an apparent shifting of a portion of the material of the belt, thus affecting the darkening of the N. part of the equatorial zone.
3. The widening and more definite aspect of the S. equatorial belt, and an increase of the number of light and dark spots on this belt. Also the accumulation of material preceding the Great Red Spot so as to form an additional shoulder somewhat less decided than the following shoulder, thus enclosing the lower half of the Great Red Spot in a kind of bay.
4. The general fading of the Great Red Spot, though there were alternate indications of greater visibility, not wholly attributable to atmospheric conditions; also the ruddy tint has been superseded by a greyish tone.
5. The N. temperate band has been generally seen duplex, attributable to the widening of the division.
6. The S. temperate band has been quiescent.
7. The N. polar region has been wider and darker than normal. The ringed aspect of both N. and S. polar regions has frequently been very decided. Dark patches have occasionally been seen on the N. polar region.

As in previous Memoirs the surface has been divided into six sections for purposes of comparison, each section comprising 60° of longitude, that is, the distance on each side of the central meridian is about 30° , such arrangement fairly avoiding distortion incident to curvature of surface. Reference to Memoirs for 1891 and 1892 will more fully explain this method to new Members of the Section.

Changes in the latitude of the belts have been very marked during the apparition. Again the Director would call special attention to these changes in hope the cause of this striking characteristic may be ascertained. Mr. A. Stanley Williams' masterly paper "On Drift of Jupiter's Atmosphere" should be carefully studied in order to a competent apprehension of this interesting but confessedly mysterious subject; its elucidation is more hopeful, as several of the sectional workers are adopting the micrometer as an aid to accuracy.

The proper motion of prominent spots, as differing from the planet's rotation, is engaging some attention. Specimens of data to hand will be found at the end of this part. Ephemerides of the central transit of some of these spots will be furnished to Members who are willing to make this subject a spécialité.

The total range of date of the 250 drawings is from August 27, 1895, to May 20, 1896.

The following is a general description of the drawings in the six Sections.

Section I., longitude 0° to 60° .—There are 41 drawings in this Section. Most of these are available for comparison, making, of course, the usual allowances. The Great Red Spot is shown more or less distinctly in 19 of these drawings. There are 14 drawings in which it is not shown. This is largely owing to the fact that it is slowly but certainly fading from view. Dr. Marth states that it follows the zero meridian about a quarter of an hour at present. This points to possible longitudinal changes, and that its period of visibility in moderate telescopes is passing away. The preceding shoulder (a recent formation) is shown in 13 drawings in this Section. The duplexity of the S. equatorial belt is shown in 20 drawings, in some instances very plainly. The darkening of the N. portion of the equatorial zone is shown in five drawings, and faintly indicated in several others. The thinning of the N. equatorial belt is shown in all the drawings, more evidently in those subsequent to September 1895. The faint equatorial belt is shown in seven drawings. The duplexity of the N. temperate band is shown in three drawings of later date. The faint wisps on the equatorial zone were seen by five observers. The N. and S. temperate bands are shown in all the drawings, and seven observers were fortunate enough to see the S.S. and the N.N. temperate bands. Six observers show the dark spot No. 1 on the N. tropical zone. Other dark spots are shown on the same zone. Messrs. Anderson, Mee, Hall, Foulkes, Ellis, Griffiths, Waugh, MacEwen, Maw, Meares, Lunt, Ellerbeck, Roberts, Antoniadi, Goodacre, Offord, Davis, and Wykes send drawing and descriptions to this Section.

Section II., longitudes from 60° to 120° .—There are 18 drawings in this Section, of these nine are available for comparison. The duplexity of the S. equatorial belt is shown in all the drawings, and its disturbed character is shown very plainly in three of Mr. MacEwen's. On the equatorial zone elongated and broken wisps are shown on two drawings. The faint equatorial belt is shown more or less on nine, and the additional and temporary belt on the N. portion of the zone is shown in one drawing. The gradual diminishing of the N. equatorial belt is well shown in this Section according to date. The duplexity of the N. temperate band is shown in two. Messrs. MacEwen, Roberts, Griffiths, Freeman, Mee, Wykes, and Ellis contribute drawings to this Section.

Section III., longitudes 121° to 180° .—There are 20 drawings in this Section. Of these 14 are available for comparison; 11 drawings show the duplexity of the S. equatorial belt, two of Mr. Griffiths' show the remarkable trumpet-mouthed rift debouching into the equatorial zone. The darkening and disturbed character of the zone is shown in two, and the faint equatorial belt is seen in five, and the belt on the N. portion in two drawings. The duplexity of the N. equatorial is shown in two, and its slenderness in all the drawings, as per date. The temperate bands are shown in all the drawings, the duplexity of the N. band in one. The dark spot No. 1 is shown on the N. tropical zone in four drawings, as per date. A remarkable wavy light marking is shown by

MacEwen as extending from the spot nearly the whole length of the disk. Dr. Smart and Messrs. Davis, Roberts, Meares, Mee, Waugh, MacEwen, Griffiths, and Foulkes contribute to the Section.

Section IV., longitudes 181° to 240° .—There are 28 drawings in this Section. The S. equatorial belt is shown duplex in 20, and a rift is shown on the N. edge in two, and dark spots are shown on 19, MacEwen and Roberts being the chief delineators of these spots. The faint equatorial belt is shown in five drawings. The equatorial zone is shown much disturbed in three, especially in Offord's. The faint belt on the N. portion of the zone is shown by Offord. The N. equatorial belt is shown diminishing in breadth in all, and its duplexity in six drawings. The S. temperate band is shown in all drawings, and in five with dark markings on it, especially in Anderson's. The N. temperate band is shown in all, its duplexity in two, Messrs. Corder's and Roberts'. The N.N. temperate band is shown in seven, and the S.S. temperate band in seven more or less distinctly, a sign of good seeing. Messrs. Corder, Buttemer, Ellerbeck, Offord, MacEwen, Griffiths, Ellis, Roberts, Anderson, Mee, Wykes, and Waugh contribute drawings to the Section.

Section V., longitudes 241° to 299° .—There are 33 drawings in this Section, 18 of which are available for comparison; 17 show the duplexity of the S. equatorial belt; 14 show numerous dark spots and markings. Some of the latter in MacEwen's drawings are of a peculiar shape, and indicate first-class seeing. Rifts on the N. edge are shown in two; a drawing of Ellerbeck's shows great disturbance on the S. edge of the belt; 11 drawings show the faint equatorial belt; seven show considerable disturbance on the equatorial zones; and four show wisps more or less distinctly. The N. equatorial belt is shown in all, with varying width according to date, the diminishing showing fluctuations in its progress, being very attenuated in later drawings. The two dark prominent spots are shown with various intensity in 22 drawings; very marked in a drawing by Foulkes, Offord, Antoniadi, Roberts, &c. The S. and N. temperate bands are shown in all the drawings, and the S.S. temperate band in three. The polar regions are quiescent in all, and shown slightly ringed in Dr. Smart's. Messrs. Roberts, Mee, MacEwen, Anderson, Griffiths, Offord, Antoniadi, Hall, Ellerbeck, Wykes, Foulkes, Buttemer, Davis, Maw, Cope, and Dr. Smart contribute drawings.

Section VI., longitudes 301° to 360° .—There are 25 drawings in this Section, 13 of which are suitable for comparison. The faint equatorial belt is shown on eight drawings; in the drawing by Ellis in a broken condition, and in that by Offord accompanied with purple markings on its S. edge. The S. equatorial belt is shown duplex in 21, and much disturbed in five; with dark spots on its N. edge in seven, and with curved markings in two drawings. The Great Red Spot is shown in four, and the bay in 12, with the preceding shoulder in 12 drawings, showing the fading of the spot, and the distinct formation of the shoulder. The N. equatorial band is shown in all the drawings, and duplex in two. The S. and N. temperate bands are shown in all, and

traces of the S.S. and N.N. temperate bands in several drawings. In this Section Mr. Offord's drawing is remarkable for the vividness of its colouring, and Mr. Davis' for the number of white spots he has discerned. In this Section Messrs. Corder, Orr, Anderson, Davis, Ellis, Roberts, Griffiths, Ellerbeck, Offord, and MacEwen have contributed drawings.

The drawings sent to Cardiff and to New South Wales, and those retained for cyclical and other purposes, are not discussed. The careful inspection and collation of all the drawings, 251 in number, has been laborious, but "a labour of love." The following is a description of 30 drawings, which have been selected as fairly representative of the work of the Section. It may be well to state here that the Members are recommended to write all except satellite returns on quarto pages, and to avoid all unnecessary repetitions in description. As before, a large amount of data has come to hand on 280 letters and 129 postcards, nearly all of which have, however, been relevant :—

Long. 0° (Antoniadi).—The Great Red Spot very distinctly shown, though the central portions are fainter. The ends of the spot are shown pointed. The S. equatorial belt is seen duplex, except the portion N. of the Red Spot. The preceding shoulder is well seen, and the following shoulder is dark and prominent. There are two spots on the N. edge, with wisps running over half of the equatorial zone, and a faint marking on the zone near the central meridian. The N. equatorial belt is thin but dense, with a faint belt a few degrees S. of it, a feature frequently seen during the apparition. A small dark spot is shown on the N. tropical zone, on the edge of the N. equatorial belt. The N. temperate band is seen duplex. The S. temperate band has two dark markings proceeding from its S. edge, and touching the S.S. temperate band, which is plainly shown. The polar regions are normal.

Long. 12° (Corder).—The date being March 4, 1896. This drawing shows a marked difference to early ones, for during the six intervening months most of the changes in the belts occurred. The Great Red Spot is shown less distinctly than on the former date, the southern portion being dark, owing to the probable overlying of the S. temperate band. The S. equatorial belt is wider and more dense, and the preceding shoulder is fully formed, forming a complete bay over which the Red Spot lies. The equatorial belt is shown. The N. equatorial belt is shrunk to its slenderest proportions, and the N. temperate belt is distinctly duplex.

Long. 13° (Griffiths).—The Great Red Spot is faint but plainly shown, having, however, lost much of its pinkish tint. The bay is plainly shown, the point of the following shoulder showing, as throughout the apparition, greater S. latitude. A rift is shown in the following portion of the S. equatorial belt terminating at its N. edge, and having plainly the usual trumpet-mouth form, with two dark spots near its mouth on the N. edge, as if the matter composing the belt were heaped up by the opening of the rift. The N.

equatorial belt is slender and dark, showing the thin detached belt parallel to the main belt. This formation is not the faint equatorial belt, but a separate formation frequently seen in good air at about this date. The S. temperate band, showing the thickening over the Red Spot, is well shown. The duplex spot is seen on the N. tropical zone.

Long. 23° (MacEwen).—The Great Red Spot very plainly shown, the observer using a 5-inch refractor, which has been highly approved for excellence of definition by Prof. Becker, and the image being good on the occasion. The S. equatorial belt is shown duplex in its following portion, and unusually roseate in hue, a feature often brought out in clear air, and when the elevation is considerable, an advantage possessed by the observer. The preceding shoulder is not so distinctly shown, it being nearer the limb and the date being earlier. The equatorial zone shows disturbances, with several light spots. The S. temperate band shows its dark portions. The N. temperate band is dark and slender, it being at the date in process of condensation. The S.S. temperate band is just shown. The N. temperate band has a remarkable widening in its following portion, a feature occasionally seen during the apparition.

Long. 47° (Roberts).—Showing the Great Red Spot passing off the preceding limb. The following shoulder being dark and well defined. The S. equatorial belt duplex and having five dark spots, three being twins. The equatorial region being much disturbed and the faint equatorial belt distinct. The N. equatorial belt getting narrow and, like the S., of a reddish hue. Three dark spots on the N. edge of the S. equatorial belt, with a twin one on the body of the belt. Three large oval light spots on the S. tropical zone. Both temperate bands very plain, with dew drop spots in close rows on the N. temperate and the S. temperate and S.S. temperate zones, seeing being very good. Polar regions normal.

Long. 60° (Smart).—Great Red Spot, though half off the disk, plain. The S. equatorial belt appearing unusually red, a circumstance often verified in good air. The belt duplex throughout and irregular on its N. edge. Equatorial zone disturbed, showing loopings descending from the belt, an appearance seldom seen now, though common some years since. The N. equatorial belt duplex and faint. The S. temperate band dense and the N. temperate band duplex. The N. polar region dark, the S. polar region less so.

Long. 82° (Orr).—Showing the S. equatorial belt dense, with dark markings on the preceding portion. The equatorial zone clear of markings. The other belts and bands as usually seen in a $3\frac{1}{4}$ -inch aperture. The shadow of Satellite I. is shown in transit.

Long. 101° (Waugh).—The S. equatorial belt is shown duplex. There are four dark spots on its S. edge, with a rift. The faint equatorial belt is seen. The N. equatorial belt has a close row of light spots on its N. edge. The N. temperate

band shows a similar feature. Both S.S. temperate bands are faintly seen.

Long. 106° (Anderson).—The S. equatorial belt has on its N. edge a remarkable light spot just past the central meridian. Also a dark, fringe-like streak on the preceding N. edge. The N. equatorial belt is dense. On the N. tropical zone there are three striking light spots. The N. temperate band is somewhat diffuse, as also the S. one. The N.N. temperate band is just shown. The polar regions are normal.

Long. 115° (Roberts).—The S. equatorial belt divided throughout with nine dark spots on its northern component, and two on its S. The faint equatorial belt is shown with three broad wisps crossing the zone at an angle. The N. equatorial belt also shows four prominent dark spots on its N. edge. There are also dark markings on both temperate bands, and a row of light spots on the S. tropical zone. Nearly the whole of Mr. Roberts' drawings show several of these dark spots.

Long. 129° (Griffiths).—The S. equatorial belt is shown duplex throughout. There are three dark markings on it. The faint equatorial belt is shown, with two slender wisps crossing the equatorial zone, on which zone there are 13 light spots. On the S. tropical zone there are 10 light spots, on the N. tropical zone there are 16, on the N. temperate zone six and the S.S. temperate zone six, making a total of 51 light spots on the visible disk.

Long. 143° (Meares).—This drawing shows the S. equatorial belt duplex, with two dark markings, the one on the N. edge projecting on to the equatorial zone, and followed by a light curve. The equatorial zone is darker than usual, as shown by other observers at about the same date. The N. equatorial belt is very faint, as if the matter composing it were partially absorbed by the zone. Both temperate bands are well shown. The shadow of Satellite III. is shown.

Long. 155° (Ellerbeek).—The S. equatorial belt is shown duplex, with two dark spots on it, the N. equatorial thin and light. Both temperate bands are distinctly shown. The polar regions are slightly ringed.

Long. 174° (Mee).—The S. equatorial belt is broad and ruddy, four dark spots lying on it. The faint equatorial belt is shown. The N. equatorial belt is narrow but distinct. The S. temperate band has three hill-like prominences on its S. edge and the N. band is distinctly duplex, as generally seen at the date. The two prominent dark spots on the N. tropical zone are well shown. The polar regions are normal.

Long. 202° (Wykes).—The S. equatorial belt is seen dense and duplex, with the shadow of Satellite III. on it. The faint equatorial belt is shown from limb to limb, the N. equatorial belt thin. The N. temperate band is shown duplex, and the S. one distinct. The two dark spots are shown on the N. tropical zone.

Long. 208° (Freeman).—A massed collection of dark spots are shown on the S. equatorial belt, N. edge. The belt is duplex. The faint equatorial belt is shown. The N. equatorial belt thin and faint. The N. temperate band is well shown duplex, and the S. band has a thickening in its middle portion. One of the dark spots on the N. tropical zone is shown.

Long. 222° (Offord).—The S. equatorial belt is plainly duplex, and flecked with dark markings. The equatorial zone is also similarly flecked. The N. equatorial belt is as two belts, one light, the N. one being dark. The S. temperate band is plainly double, the N. portion being wavy and disturbed. The S. temperate band is also duplex, its N. edge in its following portion being darker, and projecting somewhat on the S. tropical zone. The garnet spot is plainly shown, it being very visible at the date (November). The N. polar region is shown disturbed. The $12\frac{1}{2}$ inch speculum used would show the colouring of the belts well in good air.

Long. 228° (Brenner).—A wavy division is shown on the S. equatorial belt with four light spots on it. There are also nine dark spots on the N. edge of the belt, accompanied with several white spots. Curved markings are shown on the equatorial zone with light spots. The N. equatorial belt has also five dark spots on it. The N. tropical zone shows the garnet spot, and several others. On the S. temperate band there are a pair of twin light spots and one single, also some dark ones. The S. tropical zone has five light and three dark spots; there are also some small dark spots on the N. temperate band. Other spots are shown on the polar regions, which are partially banded. The total of distinct spots on the visible disk at the date was 66, the air being excellent and the observer *facile princeps* in detecting spots.

Long. 232° (Cope).—The S. equatorial belt is shown much disturbed with a curved light marking. The N. equatorial belt is shown thicker in its centre, and both temperate belts are shown with dark markings on them. The two dark spots are shown on the N. tropical zone. The polar regions are normal.

Long. 234° (Lunt).—The equatorial belt is shown broad and much disturbed, with a dark marking on its following portion. Its duplexity is fairly suggested. On the equatorial zone there are two faint belts, the N. one being a supposed offshoot from the N. equatorial one. The N. equatorial belt is thin but dense. The two dark spots on the N. tropical zone are plainly seen. The two temperate bands are shown. Light longitudinal markings shown on the polar regions.

Long. 241° (Ellis).—The division in the S. equatorial belt is shown irregular and wavy, as also is the N. edge of the belt, with dark markings on the protuberant parts, from one of which proceeds a slight wisp, not a common feature this

apparition. The equatorial zone is seen disturbed with light patches. The N. equatorial belt is shown thin and dense. The two dark spots are shown on the N. tropical zone. The two temperate bands are shown with three white spots on the S. one. There are dark markings on each polar region.

Long. 260° (Hall).—The S. equatorial belt is shown duplex and dense. There are light flocculent markings. The N. equatorial is wavy, with light markings on its N. edge. The S. temperate band is irregular, and the N. temperate band is plainly duplex. One of the dark spots shown on the N. tropical zone. Polar regions normal. The bluish tint being seen on the N.

Long. 260° (Goodacre).—About the same longitude as the previous drawing, and making due allowance for differences in date, aperture, observer, and locality, in fair correspondence. The S. equatorial belt disturbed, with three dark markings on its N. edge. The faint equatorial belt just seen. The N. equatorial belt thin and dense. The dark spot on the N. tropical zone. The two temperate bands well seen, with light bands on both polar regions. The flocculent appearance of the equatorial zone also shown.

Long. 285° (Foulkes).—The S. equatorial belt shown duplex and ruddy, with the shadow and the Satellite III. on it. The belt is margined with a dark line, from the northern of which proceed three wisps. The faint equatorial belt just seen. The N. equatorial belt irregular but dense, with prominences on S. edge. The dark spot on the N. tropical zone shown. The S. temperate band with a light spot on it, giving it a broken aspect. The N. temperate band thin. Polar regions undisturbed, both ruddy.

Long. 319° (Essam).—The S. equatorial belt dense and broad, with dark markings on its N. edge. The equatorial zone disturbed, with light and dark markings. The N. equatorial belt dense. The N. temperate band duplex. The S. temperate band irregular, with dark spots on it. The polar regions normal.

Long. 320° (Buttner).—The equatorial zone much disturbed, with dark masses proceeding from the S. equatorial belt, on which belt there are shown four prominent dark spots, the belt being also divided. The N. equatorial belt is thin but dense. On the N. tropical zone there is the prominent dark spot. The two temperate bands are plainly shown, and the N.N. temperate band is seen with a dark marking and spot on it. Both polar regions dark.

Long. 321° (Davis).—The S. equatorial belt divided up to the bay, with a rift to its N. edge. The bay is fairly shown with the preceding shoulder. There are two striking light markings on the equatorial zone. The N. equatorial belt is thin and dense at its preceding end. The supplementary thin belt is shown not far from its S. edge. There are

light spots on the N. tropical zone, and a dark marking on the S. temperate band. The S. temperate band is shown wide. Polar regions quiescent.

Long. 324° (Griffiths).—The S. equatorial belt shown duplex throughout, with a rift in its following N. edge near which there is also a large white spot; also a dark spot on its preceding N. edge. The N. equatorial belt has three dark prominences on its S. edge. There are five white spots on the N. tropical zone, and four on the S. tropical. There is a dark marking on the S. temperate band. The N. temperate band is duplex. There are three light spots on the N. temperate zone, and two on the S.S. temperate zone, making a total of about 15 light, and seven dark spots.

Long. 331° (MacEwen).—The Great Red Spot is again appearing on the disk; its outline as far as shown is distinct. The preceding shoulder is fully formed, and the equatorial belt is broad and dense, with a dark marking on its N. edge, with three prominent dark spots. The faint equatorial belt is just seen. The N. temperate band is faint, while the N. equatorial belt is distinct and duplex. S. temperate band is seen.

Long. 353° (Antoniadi).—The Great Red Spot very plainly shown; the outline being distinct. Being early in the season (September 19, 1895), the preceding shoulder in the initial stage of formation. The S. equatorial belt duplex, with three prominent spots on its N. edge, from which proceed three wisps crossing the equatorial zone nearly as far as the N. equatorial belt. The faint equatorial belt is plainly depicted. The N. equatorial belt is shown in the first stage of attenuation, as per date. Both temperate bands are seen, the N. one, as usual, more prominent. The polar regions tinted purple.

Long. 357° (Roberts).—The Great Red Spot has a small dark spot at each end. The bay and following shoulder plainly depicted. Seven dark spots are shown on the N. edge on the S. equatorial belt. The N. equatorial belt is seen very attenuated, being date May 8, 1896, nearly eight months later than Antoniadi's drawing. The faint equatorial belt is well shown; also the two temperate bands, the N. one being duplex, several dark spots on each. The S.S. temperate band, and the N. temperate band are shown with dark spots on each, an indication of first-class seeing. There are 25 dark and seven light spots on the disk, with slight indications of others. The N. polar region is dark, a feature often brought to view in good air. Altogether a remarkable drawing, and indicative of great patience and skill. This last in the reproduced drawings is the latest in date in the apparition, and the first of the series is the earliest in date. Comparison between the early and late drawings will be a suitable aid to reveal changes. Note the absence of the preceding shoulder in drawing dated August 24, 1895, and its development in drawing dated May 8, 1896, also the diversity in the N. equatorial belts, &c., &c.

CHARTS.

The increased number of charts which have come to hand during the apparition is cause for gratification, as it shows that some of the Members are waking to the value of this mode of collating and recording results. As charts of the planet's surface are a condensed collection of verified observations, they become a comprehensive method of presenting work in a compact form, and demanding, as they do, patient and persevering collation, and discussion of data, they form the best possible exercise for qualifying observers in accuracy. No worker on the Jovian surface should be content until he has constructed at least one chart during each apparition, implying, as it does, a sufficient number of partial or complete drawings of the disk. It should be added that chart drawing is by no means so difficult as at first sight it may appear, and there is not a Member of the Section but could easily accomplish the task. The Director will furnish chart forms on application.

As a specimen of such charts, one by Mr. C. Roberts, F.R.A.S., is inserted. Another of his charts will be found in the Album of drawings. The following description is chiefly taken from the MS. of Mr. Roberts:—

"The chart has been constructed from 32 drawings of the planet made between February 26, 1896, and March 27. Instrument, a Herschelian reflector, aperture 6·5-in., powers 100, 160, 200. The air was clear and steady, and the planet was exquisitely defined on an almost black field. The vast amount of detail often rendered the planet exceedingly difficult to draw, hence the greater part of finer detail has been omitted; probably a great portion of these markings was changeful. The S. polar region was of the usual grey colour, with two dark bands in latitudes $\pm 50^\circ$ and 60° S. Other bands were occasionally seen, also some dark spots. The S.S. temperate band was always seen, and frequently with dark spots on it; that in $\lambda 95^\circ$ is on several drawings. There was also a general darkening of the belt between $\lambda 275^\circ$ and 325° .

"The S. temperate zone was bright, with many very brilliant spots, often presenting the appearance of a chain of bright spots, particularly between longitudes 150° and 200° . The S. temperate band was broad and ill-defined on the S. edge. It was occasionally seen double, the N. half being darker with a number of dark spots on it; the outline being irregular in longitudes from 240° to 30° , and from 280° to 300° . This latter portion being very dark and complex. The S. tropical zone was bright, with a considerable number of bright spots and patches, with often much fine detail.

"The Great Red Spot was well seen whenever on the disk. The following and N. portions being dark, the S. portion being partly covered by an indefinite white patch. The Aureola was very distinct and of a pearly whiteness. The body of the spot has little colour; a small white spot preceded the S. portion of the Great Red Spot.

"The S. equatorial belt was unusually broad, and of a dark reddish brown. It was rifted from shoulder to shoulder. There

were three brilliant spots on it in $\lambda 80^\circ$, 295° , and 315° . On the S. half there were dark patches in $\lambda 60^\circ$ and 300° . The following shoulder was darker than the preceding one. On the N. half of the belt there were a number of dark round spots, and two bright patches.

"Equatorial zone. S. half bright with many spots and irregular patches, one in $\lambda 60^\circ$ projects into the S. equatorial belt. The S. edge between $\lambda 180^\circ$ and 160° was very brilliant. The equatorial belt was nearly always seen. It was irregular between 340° and 10° . The N. portion of this belt seemed darker than the S. As light spots were resting on it, this might be the effect of contrast. Wisps were not seen with certainty, one was suspected from the spot in $\lambda 150^\circ$.

"The N. equatorial belt was very narrow and dark, with many dark spots. The N. tropical zone was broad and bright, with many bright spots and patches, and two very dark, violin-shaped spots in longitudes 208° and 278° N.; preceding in each case there was an oval bright spot. These remarkable dark spots were in each case twin spots. There were other dark patches in $\lambda 110^\circ$ and 320° . The N. temperate band was a miniature S. equatorial belt, about 5° wide, and divided by a narrow bright rift, with dark spots and patches on the N. half. The N. temperate zone was broad and fairly bright, with several bright patches, brightest along the S. edge. The N.N. temperate band was usually well seen, sometimes with dark patches. Two of these were quite certain in longitudes 100° and 10° . The N. polar region was dark grey, with one band in λ above 50° . The following are suspected changes since February 26: 1st. The widening of the S. temperate band, and formation of more dark spots in it. 2nd. The region S. of the Great Red Spot has shown slight changes. 3rd. The N. half of the equatorial zone has darkened, and the equatorial band is narrower. 4th. The N. equatorial belt has contracted somewhat. Fresh dark spots are seen on it. 5th. The N. tropical zone is not so uniformly bright. The violin spot in $\lambda 278^\circ$ is smaller and darker. The spot in $\lambda 208^\circ$ is longer and narrower. 6th. The N. temperate band is wider, and not quite so dark, and more dark spots have formed along the N. edge."

The Director has carefully gone over the above chart and description, comparing it with his own observations and drawings, also with the drawings and observations of other Members of the Section, and he desires to bear witness to its accuracy, and to recommend it as an example. When each Member of the Section constructs such charts from an adequate number of drawings and observations of his own, the Section will have largely realised an amateur ideal of Jupiter work, and the Director thinks that nearly all the apertures employed are sufficient for the task.

ROTATION OF SELECTED SPOTS.

Some attention was paid by the Members of the Section to the rotation of prominent spots, especially the two on the N. tropical zone, viz, the so-called violin and garnet spots. The

movements of which were found not to be in accordance with the accepted rotation period. Mr. A. Stanley Williams kindly furnished ephemerides for this observation, stating, among other remarks in his accompanying letter, "The scientific value of the work of the Section would be increased if the Members were to pay more attention to this branch of Joviology, and they would also, I think, soon acquire an increased interest in the work. No micrometer is needed here, and it is doubtful if some micrometers really give more accurate results than simple eye-estimates, if carefully made." These remarks from so experienced a planetary observer are worthy of practical attention.

Mr. J. Lunt writes as follows, "I observed the two spots on the 15th of January 1896. No. 1 was central at 10.57 p.m., and the No. 2, or garnet spot, passed the central meridian at 12.48 p.m. From my observations I have come to the conclusion:—1st. That these spots are rotating faster than in $9^h 55^m 41^s$. 2nd. That No. 1 is moving faster than No. 2. 3rd. That they are getting wider apart. My time was corrected by Satellite I. eclipse disappearance and occultation reappearances." Mr. Lunt also sends the following times, which, though he speaks of them as not fully verified, are approximately correct.

November 23, 1895, No. 1 on central meridian $12^h 45^m$

" 24, 1895, No. 2 " " $2^h 20^m$ a.m.

Time interval - $1^h 35^m$ on central meridian.

January 15, 1896, No. 1 on central meridian, $10^h 57^m$

" No. 2 " " $12^h 48^m$

Time interval, $1^h 51^m$.

Transit lengthened, 16^m .

If these calculations are fully verified we have evidence that the spots are in Jupiter's atmosphere, and not on its solid surface, indeed, a similar movement to that of the solar spots. Mr. Lunt sends a further note containing valuable remarks on this interesting theme, of which is given the following abstract. "On turning my $3\frac{1}{4}$ -in. Hilger refractor on Jupiter at 5 a.m., October 25, 1895, on the N. edge of the N. equatorial belt, a spot was seen that had all the aspect of a satellite shadow. There were two other dark spots on the S. equatorial belt. When first observed at 5 a.m. the spot on the N. tropical zone had not reached the central meridian, while the darker of those on the S. belt was about central. This spot was easily visible, though quite light at 6.30 a.m. During intervals of best definition this spot had a triangular outline."

Observations by Henry MacEwen of the two prominent dark spots on the N. tropical zone of Jupiter, made with a 5-in refractor and position micrometer. Probable time error $25^m \pm$. The longitudes are taken from Marth's ephemerides. The position of the spots are corrected for the light equation. No correction for the phase defect. Weights on a scale of 5.

1ST DARK SPOT = THE VIOLIN.

Date.	G.M.T. of Transit.	Weight.	λ System II.	Remarks, and Powers used.
1895.				
Sept. 30	$\begin{smallmatrix} h & m \\ 18 & 20 \end{smallmatrix}$	Est.	$231^{\circ}4$	Good image, p. 150.
Oct. 17	16 30	—	$228^{\circ}7$	Time when position of spot was about half way from the limb to the central meridian as measured by micrometer. Three settings for distances from E. and W. limb.
„ 22	16 15	1	$223^{\circ}3$	Poor image, p. 150.
„ 27	15 20	3	$218^{\circ}7$	„ p. 150.
1896.				
Jan. 8	10 5	2	$203^{\circ}9$	„ p. 120.
„ 20	9 53	3	$201^{\circ}5$	Transit taken over position web, p. 156.
„ 27	10 35	—	$200^{\circ}0$	Observation same as October 17, 1895, but four settings instead.
Feb. 11	8 0	2	$202^{\circ}9$	P. 120.
„ 18	8 32	2	$193^{\circ}5$	P. 120.
„ 23	7 46	2	$197^{\circ}0$	On examination of note-book, regarding this apparent discrepancy, nothing was seen indicating any mistake, especially in time.

2ND SPOT = THE GARNET.

1895.				
Oct. 27	$\begin{smallmatrix} h & m \\ 17 & 15 \end{smallmatrix}$	Est.	$288^{\circ}4$	P. 150. Good image.
Dec. 11	11 27	—	$273^{\circ}1$	P. 156. Same as October 17. Four sets of measures, when spot was past central meridian.
1896.				
Jan. 28	8 22	3	$269^{\circ}8$	—
Feb. 2	7 17	2	$265^{\circ}3$	{ P. 150. Transit of p. and f. ends taken over position web of micrometer.
„ 2	7 27	1		
„ 21	7 57	4	$263^{\circ}0$	P. 120.
Mar. 9	6 58	3	$262^{\circ}2$	P. 120.

Mr. J. W. Meares reports as follows concerning the passages of these spots across the central meridian :—

Date.	Spot.	Time of passage.		Remarks.
		h	m	
15th Dec. 1895	—	12	20	3½ O.G., p. 120.
3rd Feb. 1896	—	9	30	10-in. spec., p. 180.
4th Feb. 1896	—	7	24	3½ O.G., p. 120.
10th Feb. 1896	—	10	5	—

Mr. Meares states the spot observed on the 15th December 1895, and that observed on the 4th of February 1896, were identical, giving an interval of 50^d 19^h 4^m, during which there were 124 revolutions, making the rotation period of the spot 9^h 49^m 8^s, estimating a probable error of 2^m. This spot is in Zone III. of a Stanley Williams important Drift paper in the "Monthly Notices" of the Royal Astronomical Society, Vol. 56, page 143. The Director will in future furnish forms of tables for the record of these spot observations to any sectional Member requiring them, in order to secure uniformity.

M. Antoniadi reports as follows :—

"The N. tropical zone was remarkable in 1895-96 for the appearance of two intensely red spots, shaped thus ♂, and which lasted nearly throughout the apparition. The preceding one being the first to fade. The rotation period of these spots was very rapid, this diminution of their longitudes making them appear to recede from the Great Red Spot, as an inspection of the following longitude determinations will show :—

Date.	Spot A.		Spot B.	
	Transit, G.M.T.	λ	Transit, G.M.T.	λ
1895.				
Oct. 15	h m 15 37	225°	h m 17 20±	288±
1896.				
Feb. 14	7 4±	200°	7 17±	266·8
Feb. 16			8 56±	267·2
Mar. 13			10 11±	259·4
Apr. 23			8 59	252·9

Spot A began to fade in March, so that at the late date of the above table it crossed the central meridian unnoticed. The two-fold structure of the garnet spot B was very marked on the 16th of February, on April 23 it had a little comet form to the E., while a beautiful white nimbus enveloped it all round. Another little dark spot was seen on this zone about 30° of longitude on April 24, 1896.

Mr. Hy. Ellis returns the following concerning "the dark markings on the N. tropical zone. In May they had considerably faded, appearing like long-shaped dashes." He gives the following times of crossing the central meridian :—

Date.	Spot.	λ	Central Meridian.	Central.	Remarks.
1896. Feb. 2	Second	269	h m 7 17	h m 7 25 end.	Micrometer.
" 2	"	—	7 17 Touching wire.	7 32 on wire.	Measures.
" 4	"	266	8 53	9 1	
" 23	"	255	9 38	—	
Mar. 1	"	263	10 17	—	
" 3	"	259	10 8	—	
" 25	"	259	10 5	—	
Apr. 1	"	253	10 43	—	

PART 3.

SATELLITE OBSERVATIONS.

Though the number and accuracy of observations in this department has decidedly increased, the ideal of work is still far from being reached. Forms for recording observations have been distributed to each Member, and many have availed themselves of their aid. It is hoped that all will do so ultimately. The leading difficulty has not been lack of interest, but the want of instrumental means of obtaining closely correct time. The cheap and trustworthy chronometer has yet to find its way into the market. It is thought that enterprising tradesmen would soon find it worth while to supply this deficiency, meanwhile we must be content with an approximation to what we desire.

In the selection which follows there are, however, some whose names are a guarantee of reliable correctness. The Director has selected from the forms to hand only those on which reliance can be placed.

Under this head the Director would call attention to an interesting and valuable paper by Mr. C. T. Whitmell on solar eclipses on the planet, occasioned by the several satellites as their shadows cross the disk. The paper is printed in the "Journal," Vol. VI., pages 424—427. A careful study of this paper cannot fail to impart additional interest to shadow transits.

Under the head of satellite phenomena Mr. Wm. Anderson, of Madeira, records that on January 3, 1896, as he was observing the transit ingress of Satellite II., as the satellite approached the disk, the latter seemed to recede from it, showing an apparent curvature or bay on the limb, as if for the reception of the satellite. This curious appearance was doubtless optical, unless, perchance, it was

a rare evidence of the existence of an atmosphere on the satellite, and was a refractive phenomena. If the nebular theory apply here, it is probable that when the satellites were thrown off from the parent planet the materials for the formation of an atmosphere as dense as that of the primary may possibly have also been ejected.

The Rev. S. J. Johnson records as follows. Aperture $3\frac{3}{4} \times 100$.

Date.	Sat.	Phenomena.	Times.			Times.		
1896.				h	m	s		h m s
Jan. 29 -	III.	Ec. reap. -	First seen	- 7	43	49	Bright	7 46 9
Feb. 23 -	IV.	Ec. reap. -	First glimpse	- 6	22	23	"	6 25 40
Mar. 3 -	I.	Ec. reap. -	"	- 9	2	53	"	9 5 45
" 19 -	I.	Ec. reap. -	"	- 7	21	.52	"	7 23 30
" 19 -	III.	Ec. disap.	Fading -	- 8	7	32	Gone	8 9 55
Apr. 13 -	IV.	Ec. disap.	"	- 7	50	35	"	7 55 33
" 17 -	II.	Ec. reap. -	First glimpse	9	40	45	Bright	9 43 20
May 1 -	III.	Ec. reap. -	"	- 11	45	25	Thin haze.	
" 11 -	I.	Ec. reap. -	First visibility	9	48	44	Bright	9 50 10
" 19 -	II.	Ec. reap. -	"	9	17	18	"	9 19 0

Mr. Johnson's observations of the occultations of the satellites by the moon, &c. are recorded *supra*.

Herr Brenner records as per following table. He remarks that the times suffer from a little uncertainty in the absolute correctness of his chronometer, perhaps in some cases to nearly half a minute, but his well-known trustworthiness makes his observations valuable. His general remarks *in re* the ellipticity of the satellite disks are as follows:—No. I. decidedly elliptical, No. II. doubtfully elliptical, Nos. III. and IV. certainly round. A power of 830 was used on I. Also the shadows of each satellite appeared quite round when crossing the central meridian. In the record on the 20th of February, he states that before the contact of Satellite II. the limb of the primary appeared flattened; after first contact the satellite seemed to enter on the disk for a moment, probably an aberration effect in which both the secondary and primary atmospheres were factors. On March 23 a similar appearance was presented on occasion of the transit of III. He also speaks of Satellite I. as grey when in transit. The Director would remark that ellipticity of shadow is a geometric necessity as the shadow is nearing the limb, when, of course, the polar diameter of the shadow would be longer axis. Intensity of shadow and the visibility of satellite, as also its definition, must even largely depend on the nature, tint, and tone of the primary's background during transit. Irradiation will also greatly influence the general character of these phenomena, not to mention the vagaries of our own atmosphere.

The following account of the appearances of Satellites I. and III. as in transit is interesting. Date, Monday 23, 1895, a second visibility of I. on the disk at $6^h 19^m 30^s$, at $6^h 29^m$ brighter than the rift of the S. equatorial belt on which the satellite stood, while Satellite III. at the same time grew fainter. At $6^h 32^m$ Satellite I. was invisible and Satellite III. almost dark. At $6^h 39^m 30^s$ III.

quite dark, Satellite I. suspected as a bright point. At 6^h 47^m III. black, I. invisible. At 6^h 50^m I. visible as a bright point. At 7^h 3^m III. black, I. invisible. At 7^h 46^m III. dark grey. At 8^h 30^m it became fainter, and at 8^h 42^m 54^s it was invisible. The effect in every case probably of the nature of the background.

On April 8, when Satellite II. was on or near the limb, it was at first bright, but soon grew faint. At 6^h 15^m it was almost invisible.

On April 8, Satellite I. became visible as a bright spot at 5^h 48^m. (See table.)

On December 3, Satellite II. so bright on the N. edge of the S. equatorial belt near the W. limb that it resembled a self-luminous body, quite brilliant.

Date.	Sat.	Phenomena.	Phase.	G.M.T.	Remarks.
1895. Feb. 20	IV.		From 4 ^h 30 ^m —11 ^h 25 ^m .	^h ^m ^s Sat. exceedingly faint.	
Mar. 16	IV.	Tr. Eq.	External contact.	6 8 0	
" 16	I. Sh.	Do.	Gone	7 8 0	
" 16	III. Sh.	Tr.	On disk	7 8 0	
" 16	II.	Ec. reap.	Glimpsed	8 7 6	
" 16	II.	Do.	Bright	8 10 0	
" 16	I.	Tr. Eq.	Bright on disk	5 45 0	At 5 ^h 30 ^m invisible.
" 23	II.	Oc.	Gone	5 34 0	
" 23	I.	Tr. In.	On disk	5 34 7	
" 23	III.	Do.	External contact.	5 57 0	Apparent flattening of limb. See note above, also note with reference to varied appearance on limb.
" 23	III.	Do.	Internal contact.	6 10 30	
" 23	I. Sh.	Do.	First contact	6 46 0	
" 23	I. Sh.	Do.	Quite on	6 50 0	Apparent ellipticity. See note above.
" 23	I.	Tr. Eq.	Internal contact.	7 42 45	
" 23	—	Do.	External contact.	7 46 0	
" 23	III.	Do.	Internal contact.	8 45 54	Bright.
" 23	III.	Do.	External contact.	8 55 0	
" 23	I. Sh.	Do.	Invisible on disk about about time of contact.	9 0 0	
" 8	I.	Do.	External contact.	6 9 5	
" 8	I. Sh.	Tr.	Central Meridian.	6 0 0	
Apr. 10	IV.	Oc.	Gone	8 0 40	
" 10	III.	Ec. disap.	Gone	9 8 21	
" 16	I.	Ec. reap.	First glimpse	6 33 2	
Aug. 31	IV.	Tr.	On disk	15 45 0	Invisible.
Nov. 16	II.	Do.	Bright	16 30 0	

Date.	Sat.	Phenomena.	Phase.	G.M.T.	Remarks.
1895. —	I.	Tr.	—	h m s 13 18 30	
Nov. 28 -	I.	Ec. disap.	Gone	17 8 48	Distinctly elliptical.
Dec. 3 -	I.	Tr. Im.	—	12 11 0	Bright.
1896. Jan. 13 -	I.	Ec. disap.	Gone	17 20 10	
" 25 -	I.	Tr.	On disk	6 45 0	Bright.
" 25 -	I.	Do.	Off disk	8 0 0	
Feb. 1 -	I.	Do.	External contact.	7 17 30	
" 1 -	I.	Do.	Internal contact.	7 25 30	
" 1 -	I. Sh.	Do.	First glimpse	7 31 30	
" 1 -	I.	Do.	Internal contact.	7 37 30	
" 9 -	I.	Oc. disap.	External contact.	6 8 30	
" 9 -	I.	Do.	Gone	6 10 50	
" 9 -	I.	Ec. reap.	Glimpse	8 50 0	
" 13 -	II.	Oc. disap.	External contact.	6 31 17	
" 13 -	II.	Do.	Gone	6 34 46	
" 20 -	II.	Do.	External contact.	8 45 15	Flattened limb, see note.
" 20 -	II.	Do.	Gone	8 52 0	
Mar. 11 -	I. Sh.	Tr. Im.	First glimpse	6 1 30	
" 11 -	I. Sh.	Do.	On disk	6 4 0	
" 11 -	I. Sh.	Do.	Central Meridian.	7 2 0	
" 11 -	I. Sh.	Tr. Eq.	Internal contact.	8 15 0	
" 11 -	I. Sh.	—	Gone	8 19 0	
" 11 -	I.	Tr.	Central Meridian.	6 16 0	
" 11 -	I.	Tr. Eq.	Internal contact.	7 17 0	
" 11 -	I.	Do.	External contact.	7 21 0	
" 18 -	I.	Do.	Internal contact.	9 6 0	
" 18 -	I.	Do.	External contact.	9 9 30	
" 23 -	II.	Oc. disap.	Do.	7 27 0	
—	II.	Do.	Gone	7 30 0	
Mar. 27 -	I. Sh.	Tr. Eq.	Internal contact.	6 35 0	
" 27 -	I. Sh.	Do.	Gone	6 38 0	
Apr. 1 -	II.	Do.	Internal contact.	7 2 30	
" 1 -	II.	Do.	External contact.	7 8 0	
" 3 -	I.	Tr.	Do.	4 56 0	
" 3 -	—	Do.	Internal contact.	5 1 0	
" 3 -	—	Do.	Central Meridian.	6 9 0	
" 3 -	—	Eq.	Internal contact.	7 17 0	
" 3 -	—	Do.	External contact.	7 20 0	
" 3 -	I. Sh.	Tr.	First glimpse	6 14 30	

Date.	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1896. Mar. 3	-	I. Sh.	Tr.	Internal contact.	h m s 6 17 0
" 3	-	—	Do.	Central Meridian.	7 11 0
" 6	-	III. Sh.	<i>t</i>	On disk	6 ^m 45 ^s —8 ^m 30 ^s
" 6	-	I.	—	—	Elliptical.
" 10	-	I.	Tr. Im.	External contact.	6 55 30
" 10	-	—	Do.	Internal contact.	6 59 15
" 10	-	II.	Ec.	Reap.	7 6 0
Apr. 15	-	II.	Tr. Im.	External contact.	9 21 0
" 15	-	II.	Do.	Internal contact.	9 26 0
" 24	-	II.	Oc.	Contact	6 51 0
" 24	-	II.	Do.	Gone	6 54 45
" 25	-	II.	Oc. dis.	Contact	7 53 0
" 25	-	II.	Do.	Gone	7 56 0
" 26	-	I.	Tr.	On disk	6 ^m 45 ^s —7 ^m 15 ^s
May 18	-	I.	Oc. dis.	External contact.	8 15 0
" 18	-	I.	Do.	Internal contact.	8 17 0
" 19	-	III. Sh.	Tr. Im.	First glimpse	6 7 0
" 19	-	III. Sh.	Do.	On disk	6 12 0
" 19	-	I. Sh.	Do.	First glimpse	6 41 0
" 19	-	I. Sh.	Do.	On disk	6 44 0
" 19	-	I. Sh.	Tr.	Do.	7 24 0
" 19	-	III. Sh.	Do.	Do.	7 35 0
" 19	-	I. Sh.	Do.	Central Meridian.	7 36 0
" 19	-	III. Sh.	Do.	Do.	7 45 0
—	-	I. Sh.	—	—	—

Both shadows touch.
one another.

Shadows in δ .

Both shadows just
separate thus δ .

Mr. McEwen returns as follows: Instrument 5-in. O.G. Position micrometer by Wray. Circle 4.5 inches in diameter.

Date	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1895. Oct. 22	-	I.	On reap.	Bisection	h m s 16 47 0
1896. Jan. 8	-	I.	Ec. disap.	Began to fade.	9 55 0
" 8	-	I.	Do.	Gone	10 1 0

P. 120, fair image.
N.A. time was.
16^h 48^m.

P. 120, fair image.

Date.	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1896. Jan. 9	I. Sh.	Tr.	—	h m s — — —	Shadow a little past central meridian on S. equatorial zone, touching S. edge of belt. The satellite appeared as in drawing No. 22, p. 120, fair image.
" 9	I.	Egress	Internal contact.	9 53 0	P. 120, fair image.
" 9	I.	Do.	External contact.	9 57 5	See drawing 23.
" 12	IV. Sh.	Tr.	—	—	Shadow on S. edge of equatorial belt see drawing 25.
" 19	II.	Ec. disap.	Gone	10 29 5	P. 120, fair image. 20'' 29 from tangent from S. pole.
" 28	II. Sh.	Tr.	Central meridian.	8 34 0	See drawing 38. When shadow was transiting central meridian a little darker than the second dark spot on the N. equatorial zone λ 270 \pm . See drawing No. 39 at 9.58. The shadow was quite distinct.

Mr. Hy. Ellis reports as follows, using a 6-in. O.G.

Date.	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1896. Jan. 9	I. Sh.	Tr.	Internal contact.	h m s 9 55 0	Off disk 9 ^h 38 ^m .
" 9	I. Sh.	Do.	External contact.	10 1 0	
" 25	II. Sh.	Do.	Internal contact.	10 2 0	
" 25	II. Sh.	Do.	Gone	10 7 0	
Feb. 2	I.	Ee.	Reap.	6 54 15	Bright till nearly fully on, afterwards dark, not black; shadow dense black.
" 2	I.	Do.	Bright	6 56 0	
" 4	II.	Tr.	External contact.	9 10 30	
" 4	II.	Do.	Internal contact.	9 18 0	
" 9	I.	Ee.	Reap.	8 51 0	
" 23	I.	Oc.	Internal contact.	9 37 0	
" 23	I.	Do.	Gone	9 41 0	
" 23	III. Sh.	Tr.	On limb	9 44 0	
" 23	III. Sh.	Do.	Off	9 48 0	
Mar. 1	III.	Do.	First contact	6 46 0	
" 1	III.	Do.	Internal contact.	10 20 0	Eye estimate.
" 1	III.	Do.	Off	10 29 0	
" 25	I.	Do.	Internal contact.	8 47 0	
" 25	I. Sh.	Do.	Central meridian.	10 50 0	

Date.	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1896.				h m s	
Mar. 25	-	I. Sh.	Tr.	First seen	10 57 0
" 25	-	I. Sh.	Do.	Off	11 2 0
Apr. 1	-	I.	Do.	First contact	10 31 0
" 1	-	I.	Do.	Second contact	10 37 0
" 20	-	III.	Do.	First contact	8 58 0
" 20	-	III.	Do.	Last contact	9 8 0
" 21	-	IV.	Do.	Internal contact.	8 35 0
" 21	-	IV.	Do.	External contact.	8 46 0
May 10	-	II.	Do.	Equatorial, first contact.	9 33 0
" 10	-	II.	Do.	Equatorial, second contact.	9 38 0

Mr. J. Willoughby Meares returns as follows:—

Date.	Sat.	Phe- nomena.	Phase.	G.M.T.	Remarks.
1896. Feb. 4	-	II.	Tr.	h m s 9 16 20	Visible only when near limb.
" 22	-	II. Sh.	Do.	5 35 0	
" 22	-	II.	Tr. eq.	5 43 52	
" 22	-	II.	Do.	5 52 50	
" 22	-	I.	Tr. Inq.	12 31 45	Bright, but difficult; seen dark on disk.
" 22	-	I.	Do.	12 33 45	
" 22	-	I.	Do.	12 37 7	
" 22	-	I.	Do.	13 45 0	
" 23	-	III.	Tr.	6 17 0	Gradual, disk incom- plete at first.
" 23	-	IV. Ec.	Reap.	6 21 32	
" 23	-	IV. Ec.	Do.	6 28 50	
" 23	-	I. Ec.	Do.	12 39 18	
—	-	I. Ec.	Do.	12 39 53	Sharp incline.
Feb. 25	-	I. Ec.	Do.	7 8 12	
" 25	-	I. Ec.	Do.	7 9 7	
Mar. 1	-	III. Sh.	Ingress	10 11 55	
" 1	-	III. Sh.	Do.	10 16 22	
" 1	-	III.	Tr. eq.	10 29 17	
" 2	-	I.	Do.	11 2 57	
" 2	-	I.	Do.	11 5 47	
" 2	-	I.	Do.	11 7 47	

Mr. G. T. Davis returns as follows. He also states that on May 21, 1896, at 8.30 p.m., he saw two satellites very close together, appearing like one elongated satellite. They gradually separated, and with p. 200 he saw two satellites. At 9 p.m. there seemed about the width of a disk between them, the S. satellite preceding :—

Date.	Sat.	Phenomena.	Phase.	G.M.T.	Remarks.
1896.				h m s	
Feb. 2	- I.	Tr. Eq.	External contact.	7 19 0	
" 24	- I. Sh.	Tr. Mg.	Internal contact.	7 46 0	Definition poor.
" 24	- I. Ec.	Ec. reap.	First seen	7 9 0	
" 25	- I. Ec.	Do.	Bright	7 9 15	
Mar. 3	- III.	Occ.	Reap. full	7 14 0	
" 3	- I.	Ec.	Reap.	7 24 30	Fully bright on S. equatorial belt.
Apr. 20	- III.	Tr. M.	Bisected	9 6 0	
May 2	- I.	Occ.	Bisection	9 46 0	

Mr. Gale, Secretary of the New South Wales Branch, reports the following interesting observation. On May 25, at 7^h 10^m, I observed Jupiter with a 6 $\frac{1}{4}$ -in Cooke refractor, seeing being fairly good. Satellite IV. in transit had completed about three-fourths of its path, and was remarked as quite black. In special moments it appeared as sharp as a shadow. At the same time Satellites I. and II. preceding the planet were very close, estimated distance 2". My notes run on—7^h 30^m, Satellites I. and II. still very close, distance estimated at about one-third of that of γ Leonis. Definition fair to poor; planet low; power 200. Standard time for Sydney, 10 hours E. of Greenwich.

BELT MEASURES.

In closing this part of the Memoir we give some micrometrical measures of the belts and zones of Jupiter by Members of the Section during the last apparition, showing remarkable changes in position.

Herr Brenner gives these tables of measures in Vol. VI., pages 169, 269, and 423 of the "Journal." He also gives tables of the transit of the two remarkable dark spots on the N. tropical zone. It is recommended that the articles should be re-read in connexion with the tables which are here reproduced. They give a description of the method adopted, and the instruments used, and other particulars and deductions of value. The limited space necessarily assigned to this Memoir precludes their introduction *in extenso*, but it is thought the intrinsic value of these tables and those of other observers which follow justifies insertion

here as they are more or less of permanent value. They are also specimens of what the Section is seeking to achieve.

Latitudes.	Dates, 1896.			
	Means of Drawings, Sept. to Dec. 1894.	Means of Drawings, Jan. to May 1895.	Micro- meter Measures in Sept. 1895.	---
	1.	2.	3.	4.
N. edge of S. polar region	- 51	- 49	- 0	- 45
Centre of S.S. temperate band	- 45	- 42	-	- 37
S. edge of S. " "	- 39	- 36	- 34	- 32½
N. edge of " "	- 32	- 29	- 29	- 26
S. edge of S. equatorial belt	- 24	- 23	- 22	- 21
N. edge of " "	- 9½	- 9	- 7½	- 7½
Equatorial band	- 4	- 3½	Irregular	
S. edge of N. equatorial belt	+ 3	+ 5	+ 4½	+ 6
N. edge of " "	Varying		+ 11	+ 9
S. edge of N. temperate band	Varying		+ 21	+ 20
N. edge of " "	+ 22	+ 25	+ 24	+ 26
Centre of N.N. " "	+ 31	+ 30½	+ 32	+ 31
N. edge of N. polar region	+ 38	+ 36	+ 40	+ 40

Though of earlier date the above table is given in order to illustrate the gradual shrinkage of the N. equatorial belt, and the widening of the S. equatorial belt during the late apparition, perhaps the most remarkable Jovian change of late years.

The following table gives the latitude of the belt as taken by Herr Brenner on June 3, 1896, between 6 hours and 8 hours G.M.T.

	Latitude.	Breadth.
S. polar zone, N. edge	- 44	0
S. temperate zone	-	9' 4
S. temperate band, S. edge	- 34' 6	} 8' 2
" " N. edge	- 26' 4	
S. tropical zone	-	6' 9
S. equatorial belt, S. edge	- 19' 5	} 13' 4
" " N. edge	- 6' 1	
Equatorial zone	-	13' 3
N. equatorial belt, S. edge	+ 7' 2	} 4' 1
" " N. edge	+ 11' 3	
N. tropical zone	-	12' 5
N. temperate band, S. edge	+ 23' 8	} 7'
" " N. edge	+ 30' 8	
N. temperate zone	-	13' 1
N. polar zone, S. edge	+ 43' 9	-

The following table of measures is by Mr. MacEwen. It appeared in the "Journal," Vol. VI., page 336. Its value justifies its partial reproduction here. The small discrepancies are fairly covered by atmospheric fluctuations, and the margin of observational errors incident to amateur work.

Dates.	G.M.T.	Limiting Latitudes. System II.	N. Equatorial Belt.		S. Equatorial Belt.		Polar Diameter.	Power, &c.
			N. Edge.	S. Edge.	N. Edge.	S. Edge.		
1895. Dec. 13	hrs. 12	298 — 326	+ 13½	+ 6	- 6½	- 20½	41'66	Good images. 156
1896. Jan. 9	10	333 — 15	+ 12	+ 8	- 5½	- 18	43'96	156
" 19	10	4 — 47	+ 11½	+ 6	- 7	- 21	44'26	76
" 20	9	157 — 190	+ 11	+ 5½	- 8	- 21	41'63	76
" 22	9	101 — 134	+ 11	+ 6	- 7½	- 20	44'60	76
" 28	9	302 — 324	+ 12½	+ 5½	- 6½	- 18½	44'75	76
Feb. 1	8	170 — 193	+ 11½	+ 7	- 7½	- 19	43'38	76

The following tables are also by Mr. MacEwen, and are taken from his MS. report and from his series of drawings. A position micrometer was used in each case, power 156, and the images were good.

In Table 2 the limiting longitudes (System II.) were 298° — 326°.

Distance from N. pole to N. edge of N. equatorial belt	15'95
" " S. " "	18'17
" " N. edge of S. equatorial belt	23'17
" " S. " "	28'84
Polar diameter	- 41'66

The above are the mean of three settings for each determination. The polar diameter given by Marth in M.N. is 41''·23, a very satisfactory agreement with the above measure. The dates of the above measures are about December 13, 1896.

The following table was taken on January 9, 1896, the instrument and general conditions being identical:—

N. pole to N. edge of N. equatorial belt	- 16'60
" S. " "	- 18'65
" N. edge of S. equatorial belt	- 23'66
" S. " "	- 28'66
Polar diameter	- 43'96
Per Marth's ephemeris	- 43'33

Hence excess of measured over computed is 0''·63. Limiting longitudes, System II., 333° — 15.

The next of Mr. MacEwen's tables was taken on the 19th January 1896. Limiting longitudes, System II., $4^{\circ} - 47^{\circ}$.

N. pole to N. edge of N. equatorial belt	- 17.56
" S. " "	- 19.84
" N. edge of S. equatorial belt	- 22.97
" S. " "	- 30.65
Polar diameter	- 44.26

It is regretted that the whole of Mr. MacEwen's tables cannot be inserted owing to publishing limits of the "Memoir."

Mr. W. H. Maw gives the following measures in his report. The dates are January 28 and 29 and February 4, 1896, the means being taken. He remarks that the observational conditions were not satisfactory, definition being indifferent.

S. temperate band (centre)	- 28.2 S.
S. equatorial belt, S. edge	- 18.0 S.
" " N. edge	- 7.8 S.
N. equatorial belt (centre)	- 7.7 N.
N. temperate band (centre)	- 22.2 N.

The diversities in the above tables are accounted for by differences of date and diversities in personal equation. They, however, arise chiefly from the remarkable changes in latitude transpiring more or less during the whole apparition.

PART 4.

GENERAL SUMMARY.

This part, as in previous Memoirs, will be a brief summary, and a few deductions from the reports and drawings to hand. Several of these deductions are necessarily recorded in Parts 1 and 2, and need not be repeated here. The most promising feature of the Section's work has been the disposition to record observations in chart form, which is decidedly on the increase. The Director never felt more proud of the general quality of his co-workers' labours than during the late apparition, which, despite the unusually bad weather conditions, bears favourable comparison with previous seasons. Several recent additions to the staff in particular have shown much earnestness and energy in their work. Another important point is that several of the Members have undertaken to note the rotation period of prominent spots, for which activity the Section is largely indebted to the aid and stimulus of Dr. Marth and Mr. Stanley Williams. Other tables might have been added to those in Part 2, but it was thought best only to publish those of undoubted value.

The latitude of the leading belts, and their variations, have also engaged much attention, as the tables in Part 3 show. This feature of the planet's disk has been so marked during the apparition as to enforce close attention, the result of which has been a general closer attention to latitude correctness, which is well shown in the far greater accuracy of the drawings as a

whole, and here the Director has been greatly aided by those Members who felt the special importance of this inquiry.

In any discussion of data the Great Red Spot still claims first place, on account of its uniqueness as well as its past wonderful history. Whether it be a protuberance of the more solid portion of the planet, or gaseous emissions from some vast volcano, or a mere floating, incandescent cloud in Jupiter's marvellous atmosphere still remains a mystery. Some things anent are, however, certain, that it retains pretty much its original form and size, and that the aerial matter around it floats by it and is not materially hindered in its current westward, and that it is gradually fading from view; whether a substantial declining or from the accumulation of overlying vapours, or the dying out of the forces which occasioned it, the present data does not determine. The drawings and descriptions, however, show less markedly than heretofore the ringed appearance which seems to justify the supposition of overlying summit cloud, also that this cloudy matter is frequently driven westward, rendering the preceding portion less visible, and apparently dispersing it by current forces. Also the heaping up by the same current force of the following portion, rendering its aspect there evidently dense. Nearly all the sectional drawings showing the Red Spot illustrate these remarks, and in addition the brightness of the so-called aureola has apparently diminished. Here the partial overlapping of the N. edge of the S. temperate band should be mentioned as, indicating a higher level in that part of the band, several drawings show this feature. Generally it may be inferred that the decreasing visibility of the Great Red Spot is incontestable.

The feature of the planet's disk next claiming attention is the remarkable shrinkage in width of the N. equatorial belt. The drawings show that this commenced in the early part of the apparition, and that it was associated with increased density, and the absence of any marked spots on its surface or edges. Also that there was a diffusion of darkish matter from its S. edge on to the equatorial zone, which ultimately took the form of a faint belt, shown in several drawings, but requiring good seeing conditions. It was, however, plain enough to be sometimes mistaken for the faint equatorial belt. This outgrowth, or throwing off of an additional equatorial belt, is most interesting, and may cast light on the causes of belt producing and growth, and possibly help to explain the occasional duplexity of other belts. In any case these changes in the N. equatorial belt show that powerful forces are still in activity in the planet's atmosphere, pointing possibly to still greater changes, having undoubtedly a cyclical value. The equatorial zone itself, apart from its N. portion, has been comparatively quiescent, there having been fewer wisps, light patches, or dark or white spots, than in previous apparitions. The faint equatorial belt has, however, been fairly well seen during the apparition, though frequently in a broken aspect.

The S. equatorial belt has widened about 2° , it has also become more dense and more ruddy. When seeing has been good its duplexity has been very apparent, as all the best drawings plainly show; dark and light spots and light rifts opening into the

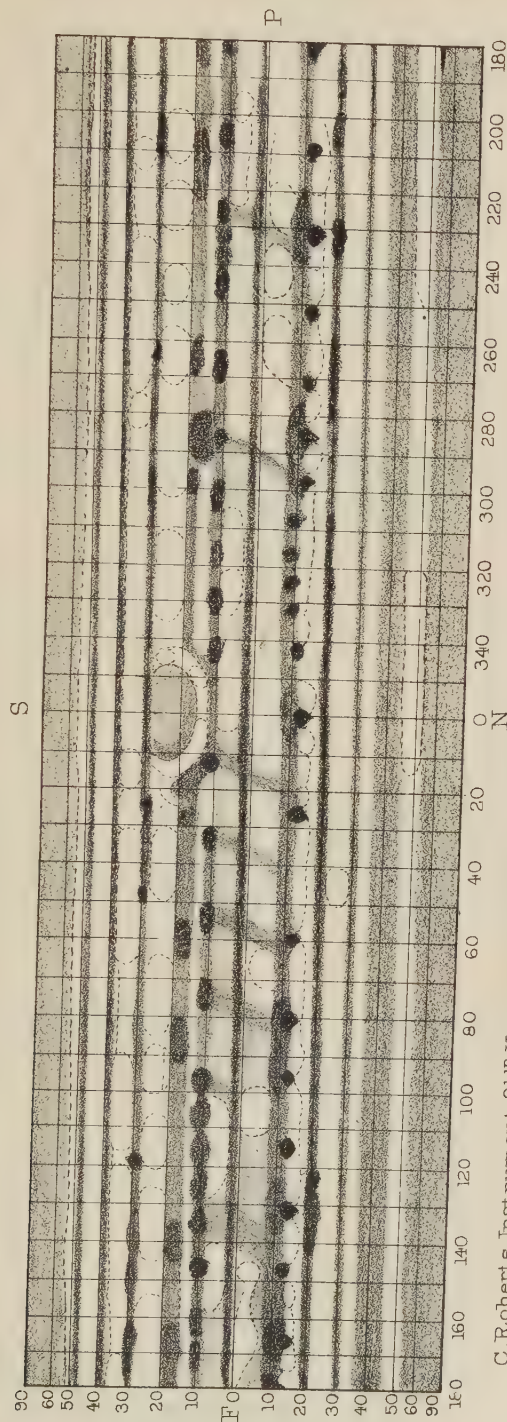
equatorial zone are plainly depicted in drawings by Messrs. MacEwen, Griffiths, and Roberts, the Director, and others. But by far the most striking feature in this belt during the apparition has been the formation of a new shoulder preceding the Great Red Spot, less distinct and dense than the following shoulder, but sufficiently so to produce a well formed bay in which the Red Spot lies. That this shoulder is an extension of the forked aspect of that portion of the belt seems probable, and that it moved eastward and stopped short of the Great Red Spot some 6° would seem to lend force to the theory of repulsion attributed to the spot. In the later drawings this shoulder is shown as bending northwards and touching the N. portion of the belt. Of course the rotational drift could not have produced the formation in its eastward growth. It is the current opinion that it has come to stay awhile.

The duplexity of the N. temperate band during the later period of the apparition is a marked feature, and points to still further activity, an activity possibly alternating with the N. equatorial belt. The S. temperate band has also shown partial activity, especially in the vicinity of the Great Red Spot. The only other feature of the apparition calling for special notice is the prominent appearance of two spots in the N. tropical zone, and their gradual detachment from the N. equatorial by its southward shrinkage. Their form and colour has suggested their names, and they have been carefully watched to determine their rotational period. They are so fully reported in Part 2 as not to require further notice here. As hinted above, it is believed that the apparition of 1896 and 1897 will be characterised by still further changes, which it is hoped the Section will duly record in various ways, which hope will doubtless animate to increasing diligence.

The discussion of the phase of Jupiter, in which Capt. Noble and Stanley Williams took a prominent part (whose papers appeared in the "Journal"), awakened much interest among the Members of the Section, and several interesting communications reached the Director relating thereto, but as the point of visibility in moderate apertures may be regarded as practically negatived, they are omitted, though reference should be made to carefully prepared tables by Dr. Smart in which he gives for three months near quadrature the amount of illuminated surface for every day, and other related figures, for which and other useful tables the Section is greatly indebted to their able co-worker. The shading on the disk accompanying the phase is, however, shown on several drawings, it being visible in exceptionally clear air, irrespective of power used.

It may be well to record that an application was made to the Director by the Secretary of the New South Wales Branch for a number of Mr. Green's drawing forms, satellite forms, and instructions, in order to enable the formation of a Jupiter Section at Sydney, the special direction of which must necessarily be local, but it is understood that the results will be submitted to the Director in England for publication in the Memoir.

CHART OF JUPITER.



C. Roberts, Instrument, 6 $\frac{1}{2}$ " Herschelien Reflector, Powers 150, 190, 320, Constructed from 34 drawings made between 9 August and 10 September 1895.

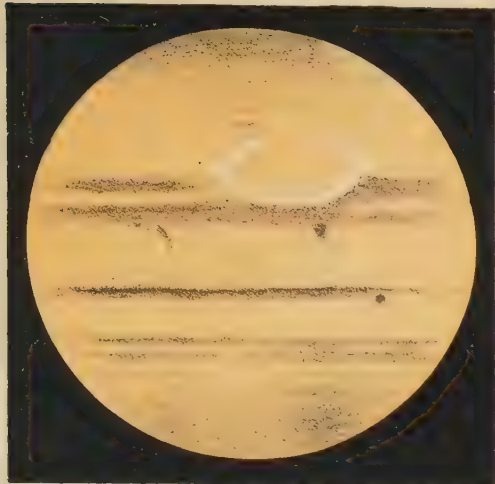


Fig. 1 E. M. Antoniadi. $9\frac{1}{2}^{\text{th}}$ O.G.
1896. Apr. 24, $7^{\text{h}} 48^{\text{m}}$ Long. 0°



Fig. 2. H. Corder. $6\frac{1}{2}^{\text{th}}$ Spec.
1896. Mar. 4, $10^{\text{h}} 50^{\text{m}}$ Long. 12°



Fig. 3 H. F. Griffiths. 6^{th} Spec. Powers 140 & 260.
1896. Mar. 5, $6^{\text{h}} 45^{\text{m}}$ Long. 13°

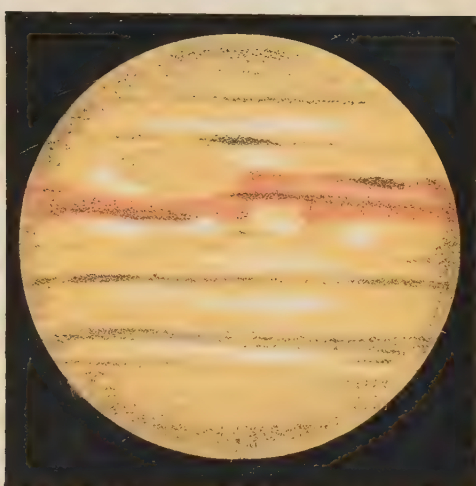


Fig. 4 H. M. Ewen. 5^{th} O.G. Power 90.
1896. Jan. 7, $9^{\text{h}} 15^{\text{m}}$ Long. 23.6°

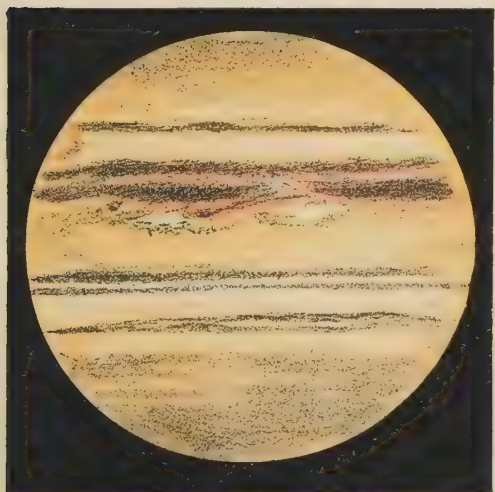


Fig. 5 D. Smart. $10\frac{1}{2}^{\text{th}}$ Spec
1896. May. 4, $7^{\text{h}} 45^{\text{m}}$ Long. 60°

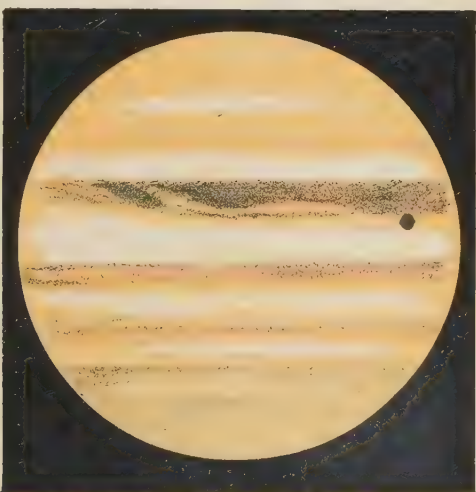


Fig. 6. J. Orr. $3\frac{1}{4}^{\text{th}}$ O.G. Power 145.
1896. Mar. 9, $11^{\text{h}} 46^{\text{m}}$ Long. 82°

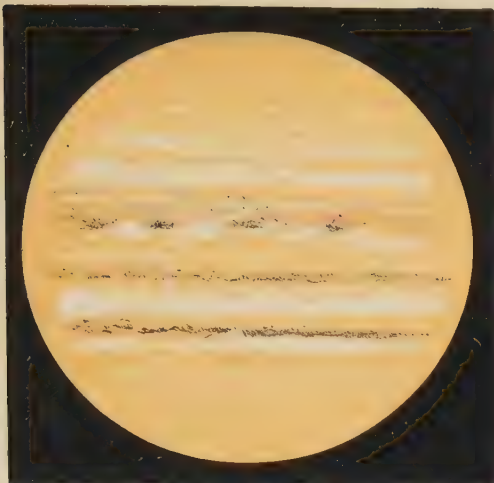


Fig. 7. W.R. Waugh. $4\frac{1}{2}^m$ O. G. Power 200.
1896. Jan. 15, $8^h 0^m$ Long. 101°

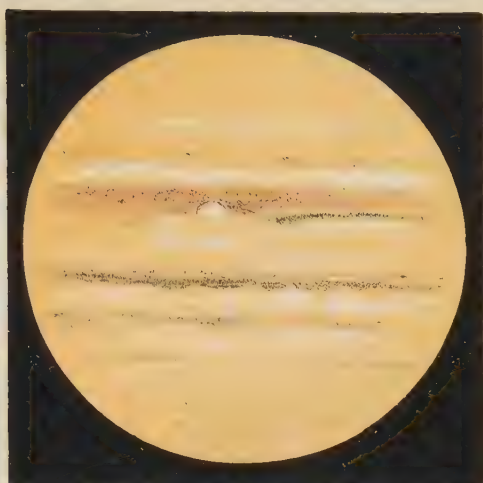


Fig. 8. W. Anderson. 5^m Spec. Power 100.
1896. Jan. 24, $10^h 30^m$ Long. 106°

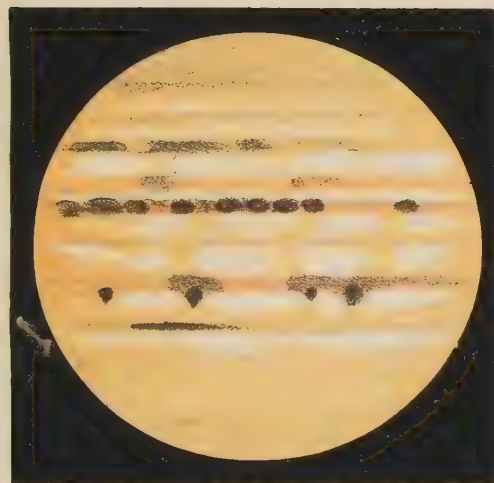


Fig. 9. C. Roberts. $6\frac{1}{2}^m$ Spec. Power 150.
1895. Sep. 8, $17^h 0^m$ Long. 115°

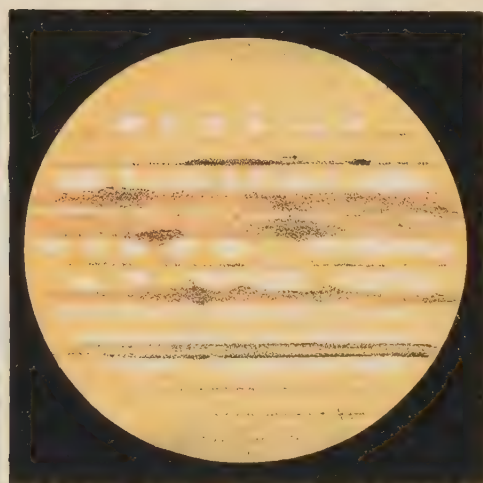


Fig. 10. H. F. Griffiths. 6^m Spec. Power 120
1896. Mar. 22, $9^h 0^m$ Long. 129°

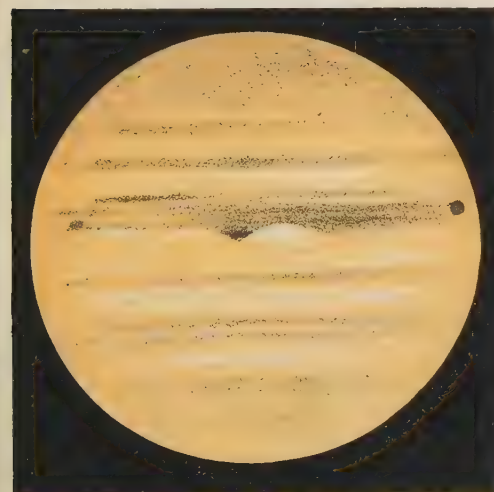


Fig. 11. J. W. Meares. $3\frac{1}{2}^m$ O. G. Power 120.
1896. Feb. 23, $6^h 17^m$ Long. 143°

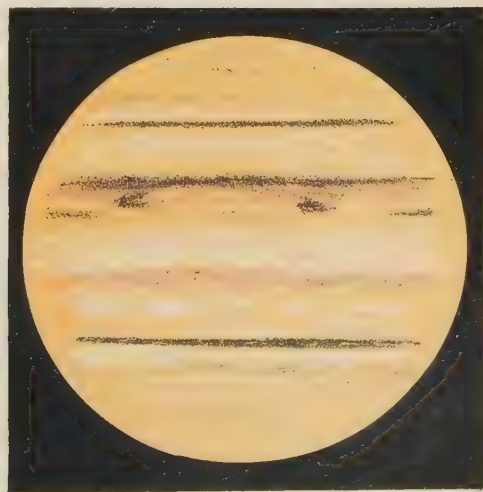


Fig. 12. H. W. Ellerbeck. $6\frac{1}{2}^m$ Spec. Power 100.
1896. Apr. 15, $9^h 31^m$ Long. 155°

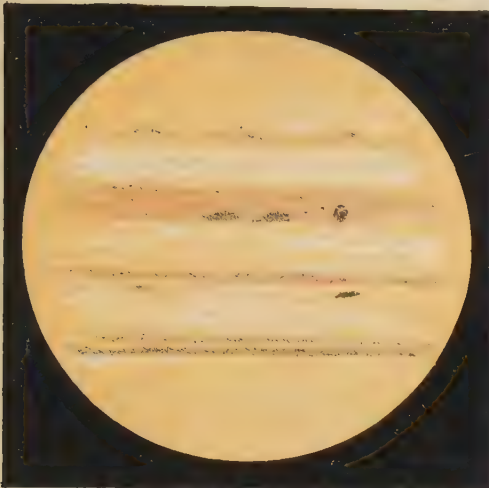


Fig. 13. A. Mee. $8\frac{1}{2}^m$ Spec. Powers, 200.
1896. Mar. 1, $7^h 55^m$ Long. $174^\circ 40'$



Fig. 14. J. Wykes. $4\frac{1}{2}^m$ O.G. Power, 120.
1896. Mar. 1, $8^h 40^m$ Long. 202°

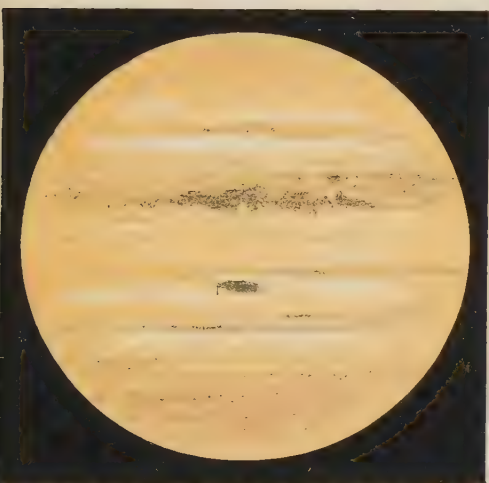


Fig. 15. A. Freeman. $10\frac{1}{4}^m$ Spec; Power, 200.
1896. Feb. 4, $7^h 45^m$ Long. 208°

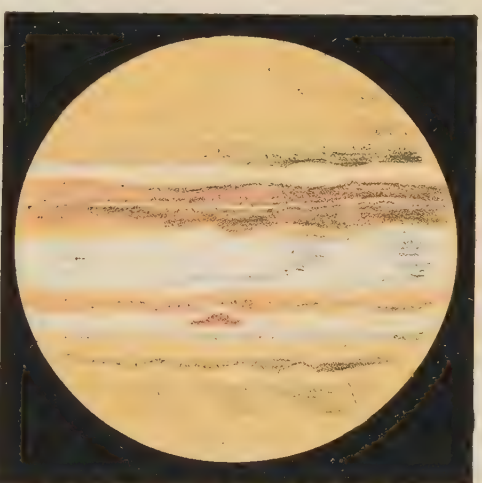


Fig. 16. J. M. Offord. $12\frac{1}{4}^m$ Spec;
1895. Nov. 30, $13^h 30^m$ Long. 220°

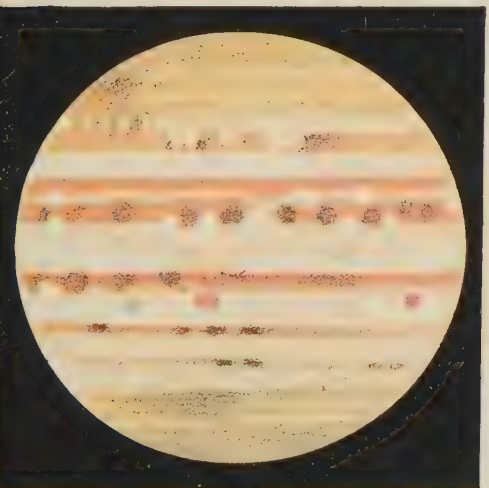


Fig. 17. L. Brenner. 7^m O.G. Power, 200.
1895. Nov. 17, $17^h 55^m$ Long. 228°



Fig. 18. E. J. Cope. $8\frac{1}{2}^m$ Spec; Power, 240.
1895. Nov. 17, $18^h 0^m$ Long. 232°

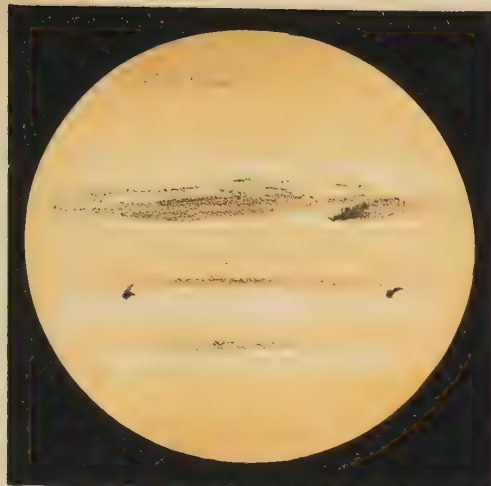
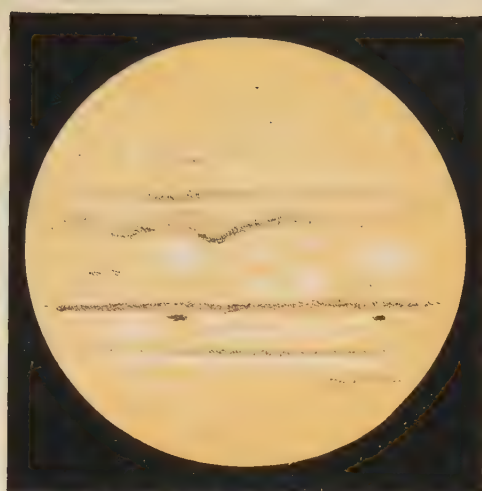


Fig.19. J Lunt $3\frac{1}{2}^m$ O.G. Powers 150 & 200.
1896 Feb. 11, 8^h 53^m Long 234°



H. Ellis $12\frac{1}{2}^m$ Spec.
Fig.20 1895. Nov. 17, 18^h 15^m Long 241°

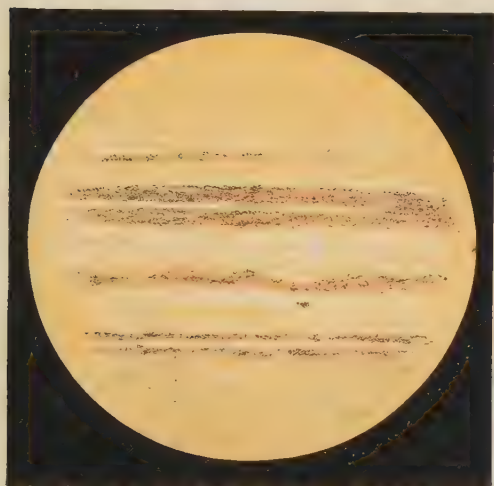
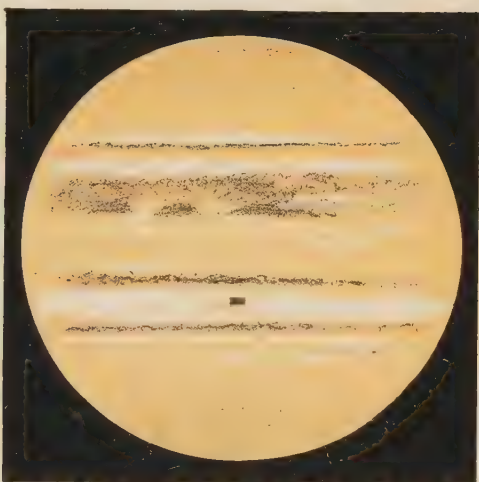


Fig 21 E. Carr 5^m Spec. Power 160.
1896. Mar. 16, 7^h 41^m Long 260°



W. Goodacre 12^m Spec. Power 250.
Fig.22 1896. Feb. 4, 9^h 5^m Long 261°

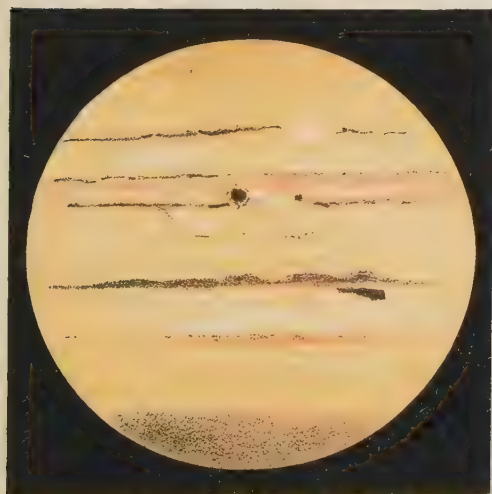
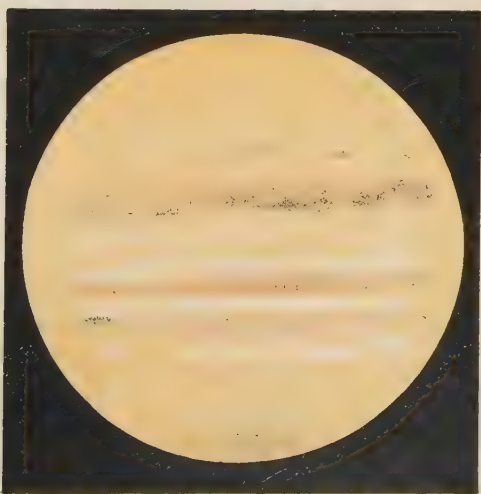


Fig.23 T.H Foulkes $10\frac{1}{2}^m$ Spec. Power 200.
1895. Oct. 24, 17^h 40^m Long 285°



E. Essam $8\frac{1}{2}^m$ Spec. Power 140
Fig.24 1896. Feb. 9, 9^h 30^m Long 319°

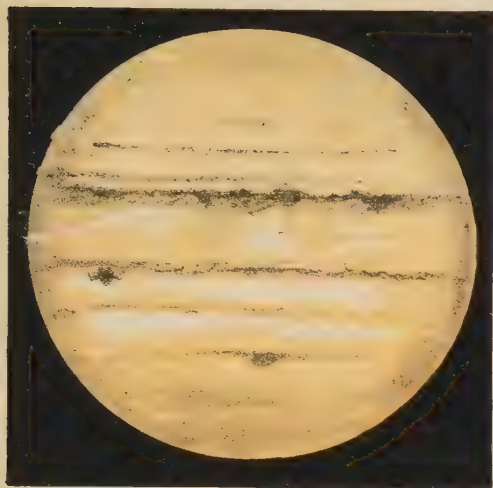


Fig. 25 R.W. Buttemer $5\frac{1}{2}^m$ Spec. Power 250.
1895. Dec. 13, $11^h 55^m$ Long. 320° .

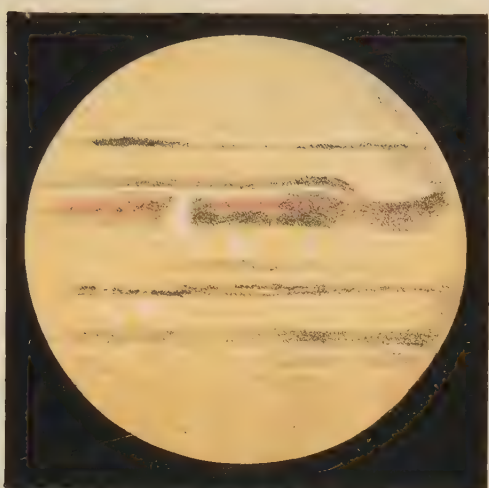


Fig. 26 G.T. Davis, $3\frac{3}{4}^m$ O.G. Power 200.
1896. May. 8, $8^h 20^m$ Long. 321° .

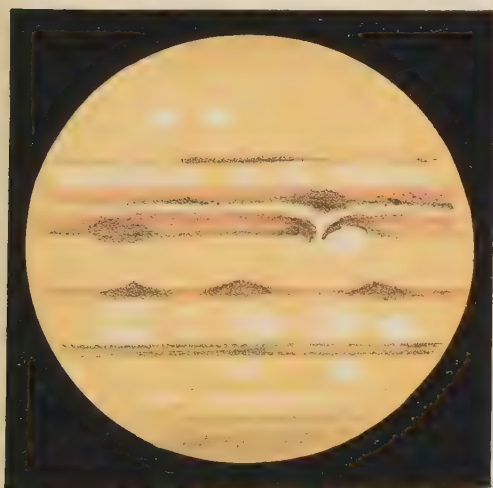


Fig. 27 H.F. Griffiths, 6^m Spec. Power 140.
1896. Mar. 28, $8^h 50^m$ Long. 324° .

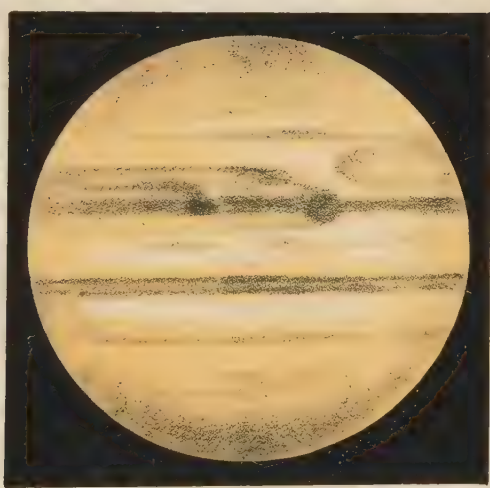


Fig. 28 H.M. Ewen 5^m O.G. Power 120.
1895. Dec. 13, $12^h 15^m$ Long. 332° .

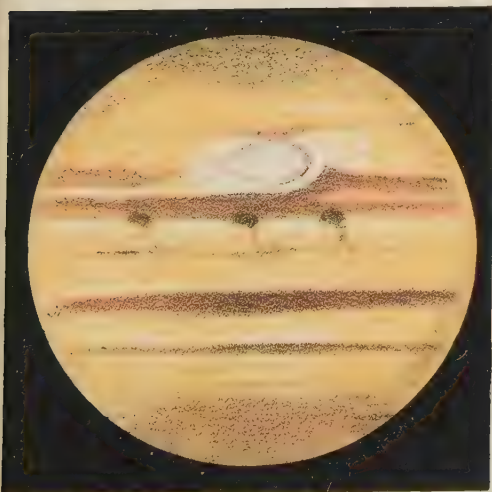


Fig. 29 E.M. Antoniadi, $9\frac{1}{4}$ O.G. Power
1895. Sep. 19, $17^h 36^m$ Long. 353° .



Fig. 30 C. Roberts, 6^m Spec. Power 180.
1896. May. 8, $9^h 20^m$ Long. 357° .

SECTION FOR THE OBSERVATION OF THE SUN.

DIRECTOR.—MISS E. BROWN, F.R.MET.SOC.

FIFTH REPORT OF THE SECTION, 1895.

Introduction.

In presenting my annual report of the Solar Section for 1895, I have only one change of plan to refer to. The old system of a "Calendar," giving the number of visible groups for each day with the most conspicuous faculæ, and a "Ledger," enlarging this bare record through verbal descriptions into the life history of each, is retained; but I have in some of the more insignificant groups omitted the *daily* description, and have contented myself with summarizing the general type or particular changes, as of increase or decrease, in each group so treated. This seemed desirable for condensation, as well as likely to give a clearer idea to the student of the varying degrees of importance between certain specially interesting groups and others of more ordinary interest. This plan, I need hardly say, could only be carried out after each group or single spot had run its full course; the possibility of a great surprise eventuating from a very small beginning being always present in this apparently monotonous but really ever varying sphere of solar observation.

I propose, in conclusion, to describe rather more fully than in former reports the points of interest which have led me to make choice of the groups selected for illustrations.

In Plate I., group 59 shows the rapid development which took place in two small spots on March 18 and during several consecutive days, more especially in the leader, an instance, as may be seen from the "Ledger," of a constantly occurring phenomenon.

In Plate II., group 83 exhibits a large spot near the E. imb, followed by a curiously fore-shortened trail of spots quite close to it. Professor Pereira thus describes this group on the 20th of

April:—"The sense of a cavity in this spot is unmistakeable, as though the crust of the sun were torn and scratched, and the black, or rather dark, under-skin, were visible beneath. Definition on this day was the best I have ever seen, enabling me to make the smallest detail reliable. On the 24th, this same spot showed a conspicuous black hole in what I may call the centre of gravity, a dazzling white bridge crossing it from S. to N.E., and a smaller one lying on the northern edge of the abyss, the brims being full of curiously intertwined points of photospheric matter."

The two last drawings on this plate were taken by direct vision, and are therefore on a smaller scale. They are the work of Mr. Wykes. His drawings also supply the material for Plate III. These latter are an interesting illustration of a class of spots which, while constantly changing in minutiae, retain in a remarkable degree a general similarity of form, every constituent developing and altering, but all remaining recognisable.

In Plate IV., group 120 has already been alluded to in the "Journal" (Vol. V., p. 513), but more details are now given, with the addition of other spots in its near neighbourhood which were peculiar and noteworthy.

Plates V. and VI. represent one of the most striking groups observed throughout the year (150), and in group 158 recall a singular appearance also described in the "Journal" above mentioned.

In the heliographic latitudes and longitudes given, I am again indebted for revision to Mr. Maunder.

NAMES of OBSERVERS from whom drawings or photographs have been received during the year.

Name.	Address.	Instrument.
BARTLETT, J.	Bramley -	4-in. O.G.
BROWN, Miss E.	Cirencester -	3-in. O.G.
CORDER, H.	Bridgwater -	6 $\frac{3}{8}$ -in. Spec.
ELD, Rev. F. J.	Polstead Rectory.	8 $\frac{1}{2}$ -in. Spec.
PEREIRA, J. DE MORAES	Azores -	4 $\frac{1}{4}$ -in. O.G.
TOWNSEND, J. S.	Sevenoaks -	4 $\frac{1}{2}$ -in. O.G.
WAUGH, Rev. W. R.	Portland -	4 $\frac{1}{2}$ -in. O.G.
WYKES, J.	Birmingham -	4 $\frac{1}{2}$ -in. O.G.

E. BROWN,
Director of the Section.

Calendar of Sun-spots and Faculæ.

JANUARY 1895.

Day.	Groups of Sun-spots.	Faculæ.
1	1, 2, 3, 4, 5, 6, 7, 8 - - -	W. 20° to 30° S.; 5° to 30° N. A tiny stream of spots, Long. 20°, Lat. 16° N.
2	2, 3, 4, 5, 6, 7, 8 - - -	E. extensive f. group 8; W. s. p. Group 2.
3	4, 5, 6, 7, 8, 9 - - -	W. numerous 5° to 20° N.; 10° to 30° S. One patch far from limb.
4	4, 6, 7, 8, 8A, 9 - - -	W. N. and S.
5	4, 7, 8, 8A, 9 - - -	W. 20° N.
6	4, 7, 8, 8A - - -	W. 10° to 20° N. and near equator.
7	4, 7, 8, 8A, 10, 11 - - -	W. 17° N.
8	4, 7, 8, 10, 11 - - -	W. numerous, region of group 4.
9	7, 8, 10, 11, 12 - - -	E. patches to the N. W. near limb N. and S.
10	7, 8, 10, 11, 12 - - -	E. near limb S.
11	7, 8, 10, 11, 12 - - -	E. conspicuous 20° to 25° N.; 15° S. W. region of group 7, and S., p. 8.
12	8, 10, 11, 12 - - -	E. numerous to the S. A few far N. W. bright s. f. 8 and group 10.
13	10, 11, 13 - - -	E. wide spread n., p. 13, and s. f. near limb. W. f. 10.
14		
15	10, 13, 14 - - -	E. to the N. of 13. To the S. of a black dot; Long. 142°, Lat. 20° N. W. f. 10 and 20° N. far from limb.
16	10, 13, 14 - - -	E. numerous, f. 13. W. 20° N. A few near equator and far S.
17	10, 13, 15, 16 - - -	W. region of group 10.
18	10, 13, 13A, 15, 15A, 16, 17, 18 - - -	E. bright patch 10° S. far from limb. W. round 10.
19	13, 13A, 15, 16, 18 - - -	E. very marked f. 16. Numerous 20° S. W. s. p. 13A.
20	15, 16, 18, 19 - - -	E. 5° to 18° S. W. 10° to 23° N.; 10° to 25° S.
21	15, 16, 19.	
22	15, 16, 19, 20.	
23	15, 16, 19, 20 - - -	E. 15° to 23° N.; 0° to 22° S. W. 10° to 33° S. N.B.—No spots appeared in this region.
24	15, 16, 19, 20 - - -	E. 15° to 23° N.; 11° to 18° S. W. 3° to 33° S.
25	16, 19, 20, 21, 22, 23 - - -	E. 15° to 23° N.; 0° to 23° S. W. 22° to 35° N.; 5° to 18°, and 23° to 35° S.
26	16, 19, 20, 21, 22, 23, 24, 25 - - -	E. 20° to 30° S.; 8° N.; 15° N. W. 7° to 30° N.; 30° S.
27	16, 19, 20, 21, 22, 23 - - -	E. 7° to 21° N.; 13° to 23° S. W. 10° to 40° N.; 2° to 13° S.
28	16, 19, 20, 21, 22, 26, 27, 28, 29 - - -	E. 8° to 20° N.
29		
30	19, 20, 21, 22, 23, 26, 27, 28 - - -	E. round and s. f. 28. W. 3° to 20° N.; 15 S.
31	19, 20, 21, 22, 23, 26, 27, 25.	

FEBRUARY 1895.

Day.	Groups of Sun-spots.	Faculae.
1		
2	20, 21, 22, 27, 28, 32 - - -	E. region of 32. W., p. 19 and 22.
3	20, 21, 22, 27, 28, 30, 31, 32 - -	A patch S.E. W. 20° S.
4	20, 21, 22, 27, 28, 30, 31, 32 - -	E. 0° to 10° S. and 25° S.W. S. of equator and 20° N. 20° S.
5	21, 27, 28, 30, 31, 32 - - -	E. 17° to 23° S. W. 13° to 24° S.
6	27, 31, 32, 33 - - -	E. on equator. W. 20° N. 20° S.
7	27, 31, 32, 33 - - -	E. 14° to 26° S. W. 6° to 22° N.; 20° to 33° S.
8	27, 31, 32, 33 - - -	E. 9° to 20° S. W. 7° to 25° N.; 15° to 25° S.
9	31, 32, 34, 36 - - -	E. 5° to 13° S. W. 5° to 23° N.
10	31, 32, 34, 36 - - -	E. 3° to 14° S. W. 5° to 20° N.
11	32, 34, 35, 36, 37 - - -	E. 7° to 23° S. W. 15° to 27° N.; 8° to 10° S.
12	32, 34, 36, 37 - - -	E. 18° to 38° S.; 15° N. W. 7° to 30° N.
13	32, 34, 36, 37 - - -	E. 10° to 20° N.
14	32, 34, 36, 37 - - -	E. 4° to 17° N. W. 7° to 23° N.; 5° to 15° S.
15		
16	36, 37, 38, 39, 40 - - -	E. 10° to 25°; N. 0° to 20° S. W. 10° to 20° S.
17	36, 37, 39, 40 - - -	E. 20° to 30° N.; 3° to 20° S. W. 10° to 30° N.; 8° to 10° S.
18		
19	36, 37, 39, 40, 41, 42 - - -	E. 0° to 3° N.; 0° to 20° S. W. 0° to 6° N.; 0° to 5° S. and patches S., p. 36.
20	36, 39, 40, 41, 42, 43 - - -	E. f. 42 far from limb. W. s. f. 36.
21	39, 40, 41, 42, 43.	
22		
23	39, 40, 41, 42, 43, 44, 45 - - -	E. n. f. 44 and 45.
24	40, 41, 42, 43, 44, 45, 47 - - -	E. 0° to 22° N.; 15° to 27° S. W. 0° to 23° N.
25	40, 41, 42, 43, 44, 45, 47 - - -	E. 8° and 20° to 25° S.; 15° to 20° N. W. conspicuous f. 40.
26	41, 43, 44, 45, 46, 47, 48, 49, 50 - -	E. 0° to 6° N. and 18° to 30° N.; 0° to 30° S. W. 0° to 20° S.
27	41, 43, 44, 45, 46, 47, 48, 49, 50 - -	E. 0° to 4° and 10° to 30° N.; 10° S. and 18° to 38° S. W. 13° to 25° N.; 5° to 20° S.
28	43, 44, 45, 46, 47, 49, 50 - - -	W. 7° to 20° S.

MARCH 1895.

Day.	Groups of Sun-spots.	Faculæ.
1	44, 46, 47, 49, 50, 51 - - -	E. region of 51. Patches near equator.
2	44, 46, 47, 50, 51 - - -	E. 10° to 30° N.; 4° to 15° S. W. 0° to 10° S.
3	44, 46, 47, 50, 51 - - -	E. 12° to 33° N. W. 8° to 20° N., far from limb; 14° to 18° S.
4	44, 46, 47, 50, 51 - - -	E. 30° to 35° N. W. 10° to 23° N.; 0° to 6° S.
5	44, 46, 47, 50, 51, 52, 53 - - -	E. 12° to 24° S., some bright. W. 12° to 25° N.
6		
7	47, 50, 51, 51A, 52, 53.	
8	50, 51A, 52, 53 - - -	E. 23° to 35° N. W. 20° to 25° and 0° to 4° N.
9		
10	51A, 52, 53, 54 - - -	E. 5° to 33° S. W. 5° to 32° N., far from limb.
11	52, 53, 54, 55 - - -	E. 2° to 10° N. W. 10° to 40° N., far from limb.
12	52, 53, 54, 55 - - -	E. 3° to 13° N. W. 10° to 32° N.
13	52, 53, 54, 55 - - -	E. 0° to 20° N.; 0° to 13° S. W. 20° to 30° N.
14	52, 53, 54, 55 - - -	E. 0° to 3° N.; 0° to 20° S. W., p. 52.
15	52, 53, 54, 55, 57 - - -	E. 0° to 23° S. W. 10° to 33° N.
16	52, 53, 54, 55, 56, 57, 58, 59 - -	E. 5° to 20° S.; 10° to 20° N. W. conspicuous n. p. 52.
17	52, 53, 55, 56, 57, 58, 59 - - -	E. 3° to 20° N. W. 8° to 25° N.
18	52, 53, 55, 57, 58, 59 - - -	E. 0° to 5° N.; 0° to 6° S. W. 10° to 30° N.
19	55, 57, 59, 60 - - -	E. small patch 20° N. W. n. f. 57.
20		
21	55, 59, 60, 61 - - -	E. 17° to 25° S.; 13° to 15° N.
22	55, 59, 60, 61 - - -	E. 10° to 23° N.; 16° to 30° S. W. 0° to 23° N.
23		
24	59, 60, 63.	
25	59, 60, 62, 63 - - -	E. 13° to 34° N. 0° to 25° S. W. 2° to 22° S.
26	59, 60, 62, 63, 64 - - -	E. 0° to 14° S. W. 0° to 23° N.
27	60, 62, 63, 64 - - -	E. f. 64. W. 5° to 20° S.
28	60, 63, 64 - - -	E. 15° to 20° N. W. 0° to 12° S.
29	60, 63, 64, 65 - - -	E. 10° to 29° N. W. f. 57 and position of 60.
30	63, 64, 65 - - -	E. 7° to 34° N. W. 13° to 26° N.
31	63, 64, 65, 66 - - -	E. 6° to 29° S.

APRIL 1895.

Day.	Groups of Sun-spots.	Faculae.
1	63, 64, 65, 66 - - -	E. 14° to 22° N.; 3° to 30° S. A patch 16° N. conspicuous.
2	63, 64, 65, 66, 67, 68 - - -	E. f. 66, far from limb, and round 68° . W. 10° N.
4	63, 65, 66, 67, 68 - - -	E. very extensive n. f. 68. W. 5° S.
5	63, 65, 66, 67, 68, 69, 70 - - -	E. N. of 68. W. branching about 10° S.
6	66, 67, 68, 69, 70 - - -	E. 5° N. W. 10° S. near limb.
7	66, 67, 68, 68A, 69, 70 - - -	E. 15° N.; 0° to 13° S. very numerous, W. 15° to 30° N.; 30° S.
8	66, 68, 68A, 69, 70, 71, 72 - - -	E. 0° to 25° S. W. 8° to 30° N. far from limb.
9	66, 68, 68A, 69, 70, 71, 72 - - -	E. 12° to 22° N.; 2° to 22° S. W. 10° to 32° N.
10	68, 68A, 70, 71, 72, 73, 74, 75, 76 - - -	E. 13° to 30° N.; 2° to 22° S. far from limb. W. 18° to 31° N.
11	68, 68A, 70, 71, 73, 74, 75, 76 - - -	E. 2° to 18° N.; 3° to 24° S. W. 5° to 30° N.; 4° to 25° S.
12	68, 68A, 70, 73, 74, 75, 76, 77 - - -	E. 0° to 15° N.; 0° to 23° S. W. 0° to 13° N.
13	68, 68A, 70, 73, 74, 75, 76, 77 - - -	E. 0° to 30° S. W. 2° to 28° N.; 15° to 25° S.
14	70, 74, 75, 76, 77 - - -	E. 0° to 32° S. W. 14° to 32° N. far from limb.
15	70, 74, 75, 76, 77, 78 - - -	E. 3° to 9° S. W. 6° to 12° N. and 25° N.
16	70, 74, 75, 77, 78.	
17	70, 74, 75, 79 - - -	W. 2° to 12° N.; 10° to 18° S.
18	74, 75, 80 - - -	W. 3° to 20° N.; 3° to 11° S.
19	74, 75, 81, 82 - - -	E. 10° to 25° N. W. 10° to 30° N.; 8° to 18° S.
20	74, 75, 81, 82, 83 - - -	E. 14° to 32° N. W. 2° to 26° N.; 8° to 23° S.
21	74, 75, 82, 83, 84, 85 - - -	E. 15° to 35° N. W. 5° to 20° N.; 3° to 18° S.
22		
23	75, 82, 83, 84, 85 - - -	E. 7° to 30° N. W. 0° to 22° S.
24	82, 83, 84, 85, 86 - - -	E. 8° to 20° N.
25	82, 83, 84, 85, 86, 87, 88 - - -	E. 6° to 22° N.; 15° to 35° S.
26	82, 83, 84, 87, 88, 89 - - -	E. 5° to 15° N.; 22° to 38° S. W. 10° to 23° N.
27	82, 83, 84, 87, 88, 89 - - -	E. 3° to 20° N.; 7° to 23° S. W. 0° to 8° N.; 0° to 8° S.
28	82, 83, 87, 88, 89 - - -	E. 15° to 30° S.: f. group 89 N.
29	82, 83, 84, 87, 88, 89 - - -	E. 15° to 30° S.; 10° N. W. 8° to 30° N.
30	82, 83, 87, 88, 89 - - -	E. 10° to 25° N.; 2° to 14° S. W. 10° to 33° N.

MAY 1895.

Day.	Groups of Sun-spots.	Faculae.
1	82, 83, 87, 88, 89, 90, 91 - - -	E. 10° N. W. 15° to 35° N.
2	83, 87, 89, 90, 91 - - -	W. near equator and f. 87.
3	90, 91, 93 - - -	E. bright patch N. of equator. W. p. 91.
4	91, 92, 93 - - -	E. 0° to 10° N.; 0° to 7° S. W. 0° to 8° N.; 0° to 5° S.
5	92, 93 - - -	E. S. of 93 in two places. W. p. 92, and a patch S. far from limb.
6	92, 93 - - -	E. f. 93 and N. of equator. W. in two places, one far from limb N.
7	92, 93, 94 - - -	E. 13° to 25° N.; 3° to 18° S. W. 0° to 20° N. In two places S.
8	93, 94, 95 - - -	E. 5° to 15° N.; 5° to 22° S. W. 13° to 27° N.; 10° to 30° S.
9	93, 95 - - -	E. 0° to 20° N.; 0° to 26° S. W. 0° to 12° N.; 20° to 28° S.
10	93, 96 - - -	E. 2° to 27° S. W. 6° to 22° N.
11	93, 96.	
12	93, 96, 97, 98 - - -	E. 10° to 25° S. W. 3° to 13° S.
13	93, 98, 99 - - -	E. 13° to 30° S. W. 10° to 25° S.
14	93, 98, 100 - - -	E. 8° to 20° N. W. N. of 93.
15	98, 100 - - -	E. many f. 100, and to the S. nearer limb.
16	98, 100 - - -	E. extensive near limb; f. 100. W. faint but numerous far S.
17	98, 100, 103 - - -	E. p. 103, 20° W., N. and S. of equator.
18	98, 100, 101, 102, 103.	
19	100, 101, 102, 103, 104, 105.	
20	100, 102, 103, 104, 105, 106.	
21	100, 102, 103, 104, 105, 106 - - -	E. 0° to 8° N.; 0° to 8° S.
22	100, 102, 103, 104, 105, 106 - - -	E. 17° to 32° S.; 5° to 8° N. W. 7° to 35° S.
23	100, 102, 103, 104, 104A, 105, 106, 107 -	E. 0° to 17° N.; 25° to 25° S.; 13° to 25° S. W. 16° to 25° S.
24	100, 102, 103, 104, 104A, 105, 106, 107, 108.	E. 0° to 25° N. W. 0° to 20° N.
25	102, 103, 104, 104A, 105, 106, 107, 108 -	E. 5° to 20° N.; 10° to 26° S. W. 0° to 15° N.; 0° to 3° S.
26	103, 104A, 105, 106, 107, 108.	
27	103, 104A, 105, 106, 107, 108, 109 -	E. 0° to 15° N. N. 6° to 23° N.
28	103, 104A, 105, 106, 107, 108, 109 -	E. 5° to 15° S. W. 5° to 33° N.
29	103, 105, 106, 107, 108, 109, 110 -	W. 10° to 32° N.
30	103, 105, 106, 107, 108, 109, 110 -	E. 8° to 20° S. W. 0° to 10° N.; 0° to 9° and 18° to 28° S.
31	106, 107, 108, 109, 110, 111, 112 - -	E. 16° to 22° N.; 8° to 17° S. W. 20° to 25° S.; patches 3° and 13° S.

JUNE 1895.

Day.	Groups of Sun-spots.	Faculae.
1	108, 109, 110, 111, 112, 113 - -	E. 6° to 22° N.
2	108, 110, 111, 112, 113 - -	E. 10° to 22° N.; 4° to 20° S. W. 5° to 25° N.
3	112, 113, 116 - - -	E. 11° to 25° N.; 5° to 24° S. W. 0° to 20° N.
4	112, 113, 115, 116.	
5	112, 113, 114, 115, 116, 117, 118 -	E. 5° to 30° S. W. 2° to 20° S.
6	112, 113, 115, 116, 117 - -	E. 8° to 22° N.; 10° to 26° S. W. 2° to 16° N.
7	112, 113, 115, 116, 117 -	E. 10° to 25° S. W. 6° to 16° S.
8	112, 115, 116, 117, 119 - -	E. 13° to 27° S. W. 5° to 20° S.
9	115, 116, 117, 119, 120 - -	Bright p. 119.
10	116, 117, 119, 120 - -	S.W. far from limb.
11	116, 117, 119, 120 - -	S.W. p. 116, conspicuous, streaky.
12	116, 117, 119, 120 - -	E. N. f. 120 and N.W.
13	116, 117, 120, 121 - -	W. p. 116, well marked, full of distinct patches.
14	116, 117, 120, 121 - -	E. very numerous, 20° S. and 30° to 35° S. W. 10° N. far from limb.
15	116, 117, 120, 121 - -	E. 18° to 33° N.; 25° to 35° S. W. 12° to 25° N.; 13° to 24° S.
16	117, 120, 121, 122 - -	E. 23° to 38° N.; 16° to 33° S. W. 13° to 25° N.; 10° to 23° S.
17	117, 120, 121, 122 - -	E. 29° to 39° N. W. 8° to 23° S.
18	120, 121, 122, 123 - -	E. 6° to 25° N. W. 8° to 23° S., with one specially bright patch.
19	120, 121, 122, 123.	
20	120, 121, 122, 123 - -	E. 14° to 27° N. W. 0° to 20° N.
21	120, 121, 122, 123 - -	E. 15° to 27° N.; 0° to 23° N.
22	120, 121, 122, 123 - -	W. two conspicuous longitudinal streams N. of 120.
23	121, 122, 123, 124 - -	E. 5° to 13° N.; 3° to 15° S. W. far S.
24	121, 122, 123, 124, 125, 126 -	E. numerous p. 126. W. about 25° S.
25	121, 122, 123, 124, 125, 126 -	W. 15° to 33° N.; 18° to 25° S.
26	122, 123, 124, 126, 127 - -	E. 10° to 18° S. W. 18° to 35° N.
27	123, 124, 125, 126, 127 - -	E. region of 127 S. W. 15° to 25° S.
28	123, 124, 126, 127.	
29	123, 124, 126, 127, 128 - -	E. 10° to 21° N. W. 15° to 23° N.; 13° to 20° S.
30	124, 126, 127, 128, 129 - -	E. 0° to 10° N.; 16° to 30° S. W. 15° to 25° N.; 12° to 30° S.

JULY 1895.

Day.	Groups of Sun-spots.	Faculae.
1	126, 127, 128, 129.	
2	127, 128, 129, 130 - - -	E. f. group 129, and a bright patch to the S. of it.
3	127, 128, 129, 130, 131 - -	E. 8° to 25° N.; 10° to 24° S. f. 129. W. 8° to 15° S.
4	128, 129, 130, 131.	
5	128, 129, 130, 131 - - -	E. 14° to 24° N.; 12° to 25° S. W. 15° to 23° S.
6	129, 130, 131, 133, 134, 135 - -	E. 5° to 23° N.; 10° to 17° S. W. p. 136 near limb and far from limb N.; 3° to 23° S.
7	129, 130, 131, 132, 133, 134, 135 -	E. 5° to 24° N.; 5° to 10° S. N. position of 128. W. 8° to 18° S.
8	129, 130, 131, 132, 133, 134, 135, 136 -	E. 0° to 27° N.; 7° to 15° S. W. 10° to 22° S. a patch far from limb.
9	129, 130, 131, 132, 134, 135, 137, 138 -	E. 3° to 26° N. W. 23° N. Long. 95° to 100°.
10	129, 132, 134, 135, 137, 138 - -	E. 8° to 25° N. W. 8° to 27° N.; 15° to 32° S.
11	132, 134, 135, 137, 138, 139 - -	E. 17° to 33° N. W. 13° to 24° N.; 5° to 30° S.
12	132, 134, 135, 139 - - -	E. 17° to 30° N.; 5° to 23° S. W. 3° to 20° N.; 15° to 35° S.
13	132, 134, 135, 139, 140, 141 - -	E. 20° to 30° N.; 17° to 25° S. W. 10° to 20° N.; 15° to 30° S.
14	132, 134, 135, 139, 140, 141 - -	E. 25° to 40° N.; 5° to 22° S. W. 10° to 25° N.; 0° to 23° S.
15	132, 134, 135, 139, 140, 141 - -	N.E. numerous. S.E. f. 141.
16		
17	134, 139, 140, 141 - - -	E. 15° to 33° N.; 10° to 23° S. W. 0° to 30° N.; 0° to 15° S.
18	134, 135, 139, 140, 141 - - -	E. 17° to 38° N. W. 0° to 30° N. Numerous f. 135.
19	140 - - -	W. 15° to 30° N.
20	139, 140.	
21	139, 140 - - -	E. 5° to 23° S. W. 8° to 32° N.; 14° to 25° S.
22	139, 140 - - -	E. 7° to 23° S. W. 15° to 33° N.; 12° to 25° S.
23	142, 143 - - -	E. 7° to 23° S. W. 18° to 30° N.; 28° to 38° S.
24	143, 144 - - -	E. f. 144.
25	144 - - -	E. f. 144.
26	144, 145 - - -	E. 5° S. a patch about 25° S. W. 20° to 30° N.
27	144, 145, 146 - - -	E. 10° to 24° N.
28	144, 145.	
29	144, 145, 147.	
30	144, 147, 148 - - -	E. about 20° N., f. 147 S. W. a few far S.
31	144, 147, 148 - - -	E. 5° to 20° S. W. 0° to 8° N.; 12° to 25° S.

AUGUST 1895.

Day.	Groups of Sun-spots.	Faculæ.
1	144, 147, 148, 149, 150 . . .	S.E. f. 147. W. 12° to 30° N.; 8° to 20° S.
2	144, 147, 148, 149, 150, 151, 152 . .	E. f. 150.
3	147, 148, 150, 151, 152, 153, 154 . .	E. 3° to 23° N. W. 7° to 23° S. conspicuous.
4	147, 148, 150, 151, 152, 153, 154 . .	E. 9° to 25° N. W. 10° to 28° S.
5	147, 148, 150, 151, 152, 153, 154 . .	E. 1° to 28° N. W. 0° to 17° S.
6	147, 148, 150, 151, 152, 153, 154.	
7	147, 148, 150, 151, 152, 153, 154 . .	W. 5° to 20° N.
8	147, 148, 150, 151, 152, 153, 154 . .	E. 20° to 30° N. W. 6° to 22° S.
9	147, 148, 150, 151, 152, 153, 154 . .	E. 2° to 20° N.
10	150, 151, 152, 153, 154, 155, 156 . .	W. S. of 151.
11	150, 152, 154, 155, 156 . . .	E. 0° to 36° N. W. 0° to 20° N., about 3° to 10° S.
12	150, 152, 154, 155, 156, 157 . . .	E. stretching N. of 156; 12° to 27° N. W. 0° to 18° N.; 20° to 30° S.
13	150, 152, 154, 155, 156 . . .	E. 12° to 30° N. W. 8° to 26° N.
14	154, 155, 156, 158, 159 . . .	E. 0° to 13° N. W. 3° to 25° N.
15	154, 158, 159 . . .	E. 0° to 22° N. W. 5° to 20° N.
16	154, 158, 159, 160 . . .	E. round 160 and a patch p. W. f. 154 numerous.
17	158, 159, 161, 162 . . .	E. 10° to 27° N. f. 158; some to the S. W. 5° to 15° N. One bright patch.
18	158, 159, 162 . . .	E. 3° to 20° N. W. 15° to 30° N.; 14° to 30° S. Conspicuous, position of 161.
19	158, 159 . . .	E. 12° to 17° N.; 13° to 25° S. W. 16° to 30° S.
20	158, 159 . . .	E. 10° to 20° S. far from limb. W. 10° to 15° N.; 13° to 30° S.
21	158, 159 . . .	E. conspicuous S.
22	158, 159.	
23	158, 159 . . .	N.E., W. a patch in the region of and p. 159.
24	158, 159, 163, 164 . . .	E. 5° to 20° S. W. 0° to 10° N.; 0° to 6° S.
25	158, 163, 164, 165, 166 . . .	E. 8° to 20° S. W. 5° to 33° N.; 20° to 33° S.
26	158, 163, 164, 165, 166 . . .	E. a small patch N. W. N. f. 163. Two dots in S. lat. near central meridian.
27	164, 165, 166, 167, 168 . . .	W. 10° to 23° S.
28	164, 165, 166, 167, 168 . . .	E. 0° to 18° N. W. 20° to 30° S.
29	164, 166, 167, 168 . . .	E. 0° to 25° N. W. 10° to 30° S.
30	164, 167, 168 . . .	E. 2° to 23° N. W. 10° to 23° S.
31	164, 167, 168 . . .	E. 8° to 25° N.

SEPTEMBER 1895.

Day.	Groups of Sun-spots.	Faculae.
1	164, 167, 168, 169 - - -	E. 5° to 25° N. W. 10° to 30° S.
2	164, 167, 168, 169, 170 - - -	E. 0° to 18° N. W. about 15° S.
3	164, 167, 168, 170 - - -	E. 0° to 12° N.; 0° to 4° S.
4	167, 168, 170 - - -	W. 0° to 4° N.; 0° to 15° S.
5	167, 168, 170, 171 - - -	W. 0° to 20° S.
6	167, 168, 170, 171, 172 - - -	E. 1° to 13° N. W. 7° to 20° S.
7	168, 170, 171, 172, 173 - - -	E. 0° to 20° N.; 15° to 22° S. W. 0° to 20° N.; 0° to 4° S., stretching from 168 to 171.
8	168, 170, 171, 172, 173 - - -	E. 0° to 30° N.; 0° to 15° S. W. 0° to 30° N.
9	168, 170, 171, 172, 173 - - -	E. 0° to 10° N. W. 0° to 30° N.
10	171, 172, 173 - - -	E. 0° to 15° N.
11	171, 172, 174 - - -	E. 7° to 10°, and 13° to 33° N.; W. 10° to 30° N.
12	172, 174, 175 - - -	(A few dots s.p. near centre of disk.) E. 25° to 30° S.; 10° to 30° N.
13	172, 174, 175, 176, 177 - - -	E. 8° to 28° N., far from limb, s.f. 174.
14	172, 174, 175, 176, 177 - - -	E. 13° to 21° N.
15	172, 174, 175, 176, 177, 178 - - -	E. 8° to 25° N., far from limb, 7° S. W. 12° to 30° N.
16	172, 177, 179, 180, 181 - - -	A few patches far from limb, E. W. n.p. 179.
17	172, 177, 181 - - -	E. 13° to 23° S. W. 3° to 17° N.; 15° to 25° S.
18	172, 177, 181 - - -	E. 7° to 11° N.; 18° to 30° S. W. 0° to 25° N. Numerous.
19		
20	181, 182, 183, 184 - - -	E., stretching far from limb 20° to 30° S.; 5° to 15° N. W. 0° to 5° N.; 0° to 3° S. and 10° to 40° S.
21	181, 182, 183, 184, 185 - - -	E. 9° to 17° N.; 9° to 18 S. W. 5° to 35° N. and 45°; 22° to 38° S.
22	181, 182, 184, 185 - - -	E. 8° to 20° N. N. f. 185 and S. W. 2° to 30° N.; 28° to 34° S.
23	181, 182, 185, 188 - - -	E. 8° to 18° N.; 9° to 14° S. W. 13° to 25° N.; 10° to 23° S. far from limb.
24	181, 182, 185, 186, 187, 188 - - -	E. 3° to 15° N. far from limb. W. 13° to 26° N.; 10° to 20° S.
25	181, 185, 187, 188, 189 - - -	E. 5° to 24° N. W. 10° to 25° N.
26	181, 185, 187, 189, 190, 191, 192 - - -	E. 6° to 27° N.; 15° to 25° S. W. 4° to 20° S.
27	181, 187, 189, 190, 191, 192 - - -	E. 5° to 29° N.; 16° to 28° S. W. 15° N.; 12° to 30° S.
28	181, 187, 189, 190, 191, 192, 193 - - -	E. 5° to 25° N. W. 15° to 25° S.
29	187, 189, 190, 191, 192, 193 - - -	E. 10° to 25° N. W. 16° to 25° S.
30	187, 189, 190, 191, 192, 193, 194 - - -	E. 10° to 28° N. W., a few 3° N. 30° S.

OCTOBER 1895.

Day.	Groups of Sun-spots.	Faculae.
1	187, 189, 190, 191, 192, 193, 194 - -	E. 14° to 30° N. W. p. group 190.
2	187, 189, 190, 191, 192, 193, 194 - -	E. 16° to 29° N. f. 194. W. p. 190.
3	187, 189, 190, 191, 192, 193, 194.	
4	187, 189, 191, 193, 194 - -	E. 5° to 16° N., and about same position S. W. 10° to 20° N.; 17° to 23° S.
5	187, 189, 191, 193, 194, 194A - -	E., spreading from 15° N., 20° S., far from limb. W. p. 189.
6		
7	193, 194, 195 - - -	E. 1° to 10° N. conspicuous. W. 0° to 21° N.; 10° to 25° S.
8	193, 194, 195 - - -	E. 20° N.; 20° S. W. numerous, n. f. 193.
9	193, 194, 195.	
10	194, 195 - - -	E., N. and S. W. n. p. 194, f. 195.
11	194, 195 - - -	E. 5° to 25° N. Position of 197, and patches to the S. W. 10° to 25° N.; 0° to 10° S.
12	194, 196, 197.	
13		
14	196, 197.	
15	196, 197, 198 - - -	E. f. 198, and N. of it.
16	197, 198 - - -	E. 9° to 17° N. W. 5° to 20° N.
17	197, 198 - - -	E. f. 198, half way to limb.
18	197, 198, 199 - - -	N.W. far from limb.
19	197, 200 - - -	E. 3° to 18° N.; 10° to 20° S. W. 15° to 30° N.
20	197, 200, 200A.	
21		
22	200, 201, 202 - - -	E. numerous round and N. of 201, surrounding and p. 202.
23	200, 200B, 201, 202, 203 - -	E., n. f. 201, s. f. 202. W. near limb, 13° N. with one small spot.
24	200, 200B, 201, 202, 203, 204 - -	E. 8° to 35° N. W. 12° to 30° S.
25	200, 200B, 201, 202, 203, 204 - -	E. 6° to 34° N. W. 10° to 30° S.
26	200, 201, 202, 203.	
27	200, 201, 202, 203 - - -	E. 15° to 35° N.; 4° to 15° S.
28	200, 201, 202, 203 - - -	E. 19° to 30° N.; 0° to 10° S., farther from limb.
29	200, 201, 202, 203, 205, 206 - -	E. region of 206. W. of 200.
30	200, 201, 202, 203, 205, 206 - -	E. 3° to 23° N.
31		

NOVEMBER 1895.

Day.	Groups of Sun-spots.	Faculæ.
1	201, 202, 03, 205, 206, 207 - -	W. 5° to 23° N.; 12° to 30° S.
	201, 202, 203, 205, 206, 207, 208 - -	E., S. of 207. W. 5° to 35° N.; 10° to 25° S.
3	203, 205, 206, 207.	
4		
5	205, 206, 207 - - -	W. 13° to 33° N. Bright round 205.
6	205, 206, 207 - - -	W. 0° to 18° N.
7		
8	206, 207.	
9	206 - - -	E. 13° to 18° N. W. 8° to 17° S.
10		
11	206, 209 - - -	W. 5° to 20° S.
12		
13	209, 210 - - -	E. 0° to 7° N. W. 10° to 25° S.
	209, 210, 211, 212 - - -	E. 0° to 20° N.; 6° to 10° S.
15		
16	210, 211, 212, 212A, 212B - -	E. f. group 205.
17	210, 211, 212 - - -	E. 10° to 13° N.
18	210, 211, 212, 212C, 213 - - -	E. 9° to 26° N.; 9° to 23° S. W. 10° to 20° S.
19	209, 210, 212, 212C, 213 - -	E. 7° to 30° N. W. 12° to 23° S.
20	210, 212, 212C, 213, 214 - - -	E. round 214. W. 20° N.
21	210, 212, 213, 214 - - -	E. 16° to 29° N.
22	210, 211, 212, 213, 214, 215 - -	E. f. 214. 19° to 30° N.
23	210, 212, 213, 214, 215 - -	E. numerous f. 215.
24	210, 212, 213, 214, 215, 216 - -	W., N. of 212.
25		
26	212, 213, 214, 215, 216 - -	E. 8° to 20° N. W. 0° to 10° S.
27	213, 214, 215, 216 - - -	E. f. 190, and a small patch very far N. W. 10° to 20° N., and p. 213.
28		
29		
30		

DECEMBER 1895.

Day.	Groups of Sun-spots.	Faculae.
1	216 - - - - -	E. 3° to 15° S. W. 10° to 30° N.
2	216, 217, 218 - - - -	E. 10° S. W. 15° to 32° N.
3	216, 217, 218.	
4	216, 217, 218.	
5		
6	218, 219, 220, 221, 222.	
7	218, 219, 220, 221, 222, 225 - - -	E. 9° to 25° S. W. 0° to 18° N.; 0° to 4° S.
8	218, 219, 220, 221, 222, 223, 224, 225 -	E. 15° to 30° S. W. 0° to 7° N.; 0° to 4° S.
9	219, 220, 221, 222, 223, 224, 225.	
10	219, 220, 221, 222, 223, 224, 225.	
11	219, 220, 221, 222, 223, 224, 225.	
12	219, 220, 221, 222, 223, 224, 225, 226 -	E. 6° to 23° N.; 0° to 20° S.
13	219, 221, 222, 223, 224, 225, 226, 227 -	S.E. W. 0° to 15° N. ;
14	221, 222, 223, 224, 225, 226, 227 - - -	W. 0° to 14° S.
15	221, 222, 223, 224, 225, 226, 227, 228 -	E. on a line with 227. W. p. 222.
16	222, 223, 224, 225, 226, 227, 228, 229.	
17	222, 223, 224, 225, 226, 227, 230 -	E. f. 229. W. S. of 222.
18		
19	225, 226, 227, 229, 230, 231 - - -	E. 20° N.
20		
21	229, 230, 231, 232, 233.	
22	229, 230, 231, 232, 233.	
23	229, 230, 231, 232, 233.	
24		
25		
26		
27		
28		
29	232, 233, 234.	
30	232, 233, 234.	

Sun-spot Report, 1895.

LEDGER.

- Jan. GROUP 1. *Long.* 65°. *Lat.* 5° N.
 [1. A small faint spot, the only remnant of group 273 (1894).
- Jan. GROUP 2. *Long.* 63°. *Lat.* 14° N.
 1-2. Two small spots, afterwards one, the last of a straggling group, 270 (1894).
- Jan. GROUP 3. *Long.* 29°. *Lat.* 15° S.
 1-2. A very small spot.
- Jan. GROUP 4. *Long.* 346° to 344°. *Lat.* 16° N.
 1-8. A large spot, more elongated than on December 31, 1894, with three nuclei, penumbra branching on the p. side instead of the f. as before, major axis 1' of arc. On the 3rd very much broken up, with two narrow sharp nuclei, some outliers. After this date it became more fragmentary. On the 5th five principal spots, on the 7th a cluster of small ones. When last seen on the 8th, about six in number.
- Jan. GROUP 5. *Long.* 355°. *Lat.* 17° S.
 1-3. An insignificant spot not far from the centre of disk, afterwards a few more.
- Jan. GROUP 6. *Long.* 334°. *Lat.* 3° N.
 1-4. A few very small spots.
- Jan. GROUP 7. *Long.* 314° to 303°. *Lat.* 8° to 13° N.
 1. A penumbral spot.
 2. Much larger and more normal, major axis 40'', a few smaller f.
 3. Nucleus dividing, a small portion detached; a swarm of dots s. f.
 4. The f. dots larger, with incipient penumbra.
 5. Main spot smaller, the f. in a stream.
 6. Much broken up, the f. in a double stream.
 7. Spots all small, but numerous and without penumbra.
 8. A new leading spot to the S. major axis 35''. The f. disappearing.
 9. New spot nearly normal, a fresh one to the rear.
 10. Much reduced, penumbra to the S.
 11. A few small spots and dots.
- Jan. GROUP 8. *Long.* 308°. *Lat.* 17° S.
 1-12. A large normal spot with curved nucleus, penumbra wider on the f. side (a return of Group 264). On the 3rd, major axis 1' of arc, nucleus bridged in several places, some outliers, which proved to be of short duration. It continued irregular until the 10th, when it again became more normal while decreasing in area. On the 11th, a small pair followed at some distance.
- Jan. GROUP 8A. *Long.* 339°. *Lat.* 7° S.
 4-7. A few very small spots.
- Jan. GROUP 9. *Long.* 10°. *Lat.* 4° S.
 3-5. A few tiny spots.

Jan. GROUP 10. *Long.* 233° to 226°. *Lat.* 15° S.

- 7-18. At first a small hazy spot, on the 8th, larger, crescent shaped. It then became normal; nucleus bridged on the 13th, major axis 35''; a stream of small spots f. By the 16th they had disappeared, the spot itself breaking up on the f. side. When near W. limb much reduced.

Jan. GROUP 11. *Long.* 292° to 285°. *Lat.* 8° to 12° N.

- 7-13. On the 7th, a small spot with slight penumbra; on the 10th, a scattered cluster, chiefly composed of very small dark spots; when near W. limb, larger and almost contiguous.

Jan. GROUP 12. *Long.* 269°. *Lat.* 16° S.

- 9-12. A few little spots near the central meridian, the most p. the largest, which alone remained and rapidly diminished.

Jan. GROUP 13. *Long.* 147° to 134°. *Lat.* 25° to 30° S.

- 13-19. A small spot on the 13th, faculæ s. f. to E. limb. On the 15th, a stream of very small spots and dots, which afterwards spread irregularly over a wide area, at last reduced to dots only.

Jan. GROUP 13A. *Long.* 194°. *Lat.* 18° N.

- 18-19. A tiny pair.

Jan. GROUP 14. *Long.* 173°. *Lat.* 15° S.

- 15-16. A very small spot with dots f.

Jan. GROUP 15. *Long.* 101° to 93°. *Lat.* 11° N.

- 17-24. A pair of very small spots; on the 18th, a larger one p. On the 23rd, a stream which gradually dwindled away.

Jan. GROUP 16. *Long.* 84° to 80°. *Lat.* 8° to 12° N.

17. A large spot very near E. limb at 12.

18. Nucleus multiple, some small followers.

19. Nucleus less divided.

20. Very compound, nuclei pointed, with a "black hole." Many sputterings f.

21. Two spots connected by a chain of dots.

22. The p. with two nuclei, nearly equal in area, the f. with one, many dots f.

23. The p. heart-shaped; three principal nuclei; major axis 40''; the f. normal; major axis 30''.

24. The p. with two large nuclei, a small spot between it and the f. apparently one of the nuclei thrown off from the p.

25. The two spots nearly equal in area, each with one large nucleus, the small one passing northwards.

26. The p. with a portion of the nucleus detached.

27. Detached portions apparently forming a small spot exterior to the large one.

28. The p. bridged. A few outliers s. f. at some distance.

Jan. GROUP 17. *Long.* 189°. *Lat.* 20° N.

18. A few very small spots.

Jan. GROUP 18. *Long.* 142° to 139°. *Lat.* 4° S.

- 18-20. At first a black dot, then a very small pair and dots, lastly a little stream.

Jan. GROUP 19. *Long.* 56° to 40°. *Lat.* 8° to 13° S.

20. A cluster of small spots near E. limb.

21. Two penumbral spots with small ones between them.

22. Great increase, both with divided nuclei.

23. The p. more normal, the f. with nuclei, forming a V reversed, dots and sputterings between. Major axis of the two 30'' and 45'' respectively.

Jan. GROUP 19—*continued*.

24. The p. sliced off, as it were, at the end; the f. semi-circular with small detached nuclei in front; dots confined to a stream following the leader.
25. P. normal, f. more regular, penumbra still opening in front, straggling spots between the two.
26. P. breaking up. The f. also, with a black hole in nucleus.
27. A train; four principal spots nearly equal in area, the most p. and f. now not larger than the rest.
28. All the spots with divided nuclei, the second very compound, elongated, and full of detail.
30. Much foreshortened, spots still more subdivided, forming almost a double train, as many as eight with penumbra.
31. Near W. limb. Some minor changes.

Jan. GROUP 20. *Long.* 23° to 15° . *Lat.* 12° S.

- 23- Feb. On the 23rd, a few small spots, afterwards a stream divided on the 26th into two sections, a few of the spots with slight penumbra.
4. On the 28th, when central, a leading spot became developed with irregular nuclei, major axis $30''$. The stream gradually decreased, and when near W. limb was nearly reduced to its original proportions.

Jan. GROUP 21. *Long.* 357° to 347° . *Lat.* 17° to 19° S.

- 25- Feb. An incipient spot near E. limb; on the 26th, larger with four nuclei forming a square; on the 28th, two smaller spots followed with outliers. The leader was then helical in shape, and after the 30th, almost normal, major axis $40''$. The f. spots dwindled, disappearing before February 3. The leader then had three nuclei, and on the 4th was split in twain. When near W. limb reduced.
- 5.

Jan. GROUP 22. *Long.* 334° . *Lat.* 15° to 18° S.

- 25- Feb. A few spots with slight penumbra, which increased in number but not in area, forming on the 28th a triangular-shaped cluster which gradually disappeared.
- 4.

Jan. GROUP 23. *Long.* 357° to 353° . *Lat.* 7° S.

- 25-27. A few very small spots following each other.

Jan. GROUP 24. *Long.* 42° . *Lat.* 21° N.

26. Three or four dots near the centre of disk.

Jan. GROUP 25. *Long.* 29° . *Lat.* 15° N.

26. A small pair with a spot f. at some distance.

Jan. GROUP 26. *Long.* 334° . *Lat.* 18° N.

- 28-31. A small nebulous spot at some distance from E. limb, which was rather larger on the 30th, with penumbra on the p. side.

Jan. GROUP 27. *Long.* 304° to 294° . *Lat.* 14° to 15° N.

28. A small penumbral spot near E. limb.
30. A train, the first and last spots considerable.
31. The largest spots more normal.
- Feb.
2. The leader and final spot with triple nuclei.
3. Leader with a portion of the nuclei detached, the final split up into four.
4. Leader with major axis $45''$. The f. spots reduced to one, a swarm of dots to the N.
5. Leader two lobed, f. spot normal, the intermediates on the wane, dots gone.
6. Nucleus of leader divided, penumbra wider on the p. side, f. spot with a great expanse of faculæ. N.B.—Groups 16, 19, 20, 21, and 27 were all of somewhat similar type, having the most p. and f. spots larger than the rest, the most f. generally dying out first.
8. Leader with two nuclei.

Feb. GROUP 28. *Long.* 317°. *Lat.* 24° S.

5. A pair of very small faint spots.

Jan. GROUP 29. *Long.* 70°. *Lat.* 7° N.

28. A few very small spots f., group 16.

Feb. GROUP 30. *Long.* 302°. *Lat.* 15° to 18° S.

- 3-5. At first a pair of nebulous spots, then a little stream, finally one only.

Feb. GROUP 31. *Long.* 281° to 276°. *Lat.* 10° to 11° N.

3. Two tiny pairs f. Group 27. (Nearly the same position as Group 11.)
4. Larger, in a stream.
5. Two spots, the p. with double nucleus.
6. The p. broken up with detached nuclei, the f. a curved stream of small nuclei.
7. The p. with spots closing round in a circle. The f. fading away.
8. The p. fast dwindling; the f. gone.
9. Three spots close together, forming a trefoil.
10. One spot.

Feb. GROUP 32. *Long.* 238° to 229°. *Lat.* 12° to 20° N.

2. A large spot near E. limb (not a return).
3. Nucleus double, a great stretch of penumbra to the S.
4. Major axis 1' of arc, the penumbra to the S. more divided and containing small nuclei.
5. Nucleus entire, but indented, spots forming to the S.; two smaller ones to the N.
6. More normal; the spots to the S. quite distinct. Four to the N.
7. The N. spots larger, two of them pairs; those to the S. decreasing.
8. Almost circular, nucleus fan-shaped. The N. spots in three sets at equal distances.
9. Nucleus bridged at one end, spots to the N. in a swarm, all reduced in size and nearly equal; none to the S.
10. Little change.
11. Nucleus bridged centrally, and a small portion detached, outliers to the N. again larger, eight or more in number. Two new ones to the S.
12. Decreasing, nucleus united at one extremity. Penumbra wider on the f. side. Outliers changing.
13. Nearly normal, penumbra opening to the E.
14. Near W. limb, penumbra equal. One penumbral spot to the N.

Feb. GROUP 33. *Long.* 241° to 238°. *Lat.* 7° to 8° S.

- 6-8. Three faint little spots, forming a triangle on the 6th; afterwards two only.

Feb. GROUP 34. *Long.* 195°. *Lat.* 18° S.

- 9-14. Small spots in two sets, first seen as a single one, two days E. of the centre of disk. In one of the p. a penumbral spot became developed with major axis 25'', after which a rapid decrease took place.

Feb. GROUP 35. *Long.* 169°. *Lat.* 14° N.

11. Two very small spots surrounded with faculæ.

Feb. GROUP 36. *Long.* 143°. *Lat.* 9° S.

- 9-20. A penumbral spot, near E. limb on the 9th, which showed remarkably little change throughout its course, major axis 40'' on the 11th. It appears to have varied a little in latitude.

Feb. GROUP 37. *Long.* 137°. *Lat.* 18° S.

- 11-19. At first a very small spot at some distance from E. limb, which gradually increased, with outliers n.f.; major axis 30'' on the 16th and a tiny stream to the N. Broken up on the 19th.

- Feb. GROUP 38. *Long.* 167° to 152° . *Lat.* 18° N.
 16. Two nebulous spots in the western hemisphere.
- Feb. GROUP 39. *Long.* 87° . *Lat.* 6° N.
 16-23. Two pairs in the midst of faculæ some distance from E. limb. On the 17th a stream of small spots; on the 19th one became penumbral, but rapidly decreased after the 20th.
- Feb. GROUP 40. *Long.* 75° . *Lat.* 9° S.
 16. A penumbral spot about half of sun's radius from the central meridian with outliers to the S.
 17. Nearly normal.
 19. Nucleus tapering, outliers N. and S.
 20. Larger, major axis $1'$ of arc, almost divided centrally, many small spots and dots p. and f.
 21. Nuclei more sub-divided.
 23. Great reduction; three spots, with slight penumbra, in a triangle.
 24. Two little pairs.
 25. One pair, a great amount of faculæ f.
- Feb. GROUP 41. *Long.* 54° to 45° . *Lat.* 8° to 13° S.
 19-27. Two small spots, widely separated, which increased in number and became a loose cluster on the 23rd, denser on the 24th, and a stream on the 26th, with a penumbral spot p. and f. Little change when near W. limb on the 27th.
- Feb. GROUP 42. *Long.* 29° . *Lat.* 3° S.
 19-25. A penumbral spot at some distance from E. limb, with major axis $20''$ on the 20th, after which it steadily declined, showing some inconsiderable changes in the nucleus.
- Feb. GROUP 43. *Long.* 357° . *Lat.* 10° N.
 20-28. A penumbral spot near E. limb at 2 p.m. On the 23rd, partially divided, re-uniting afterwards. On the 26th it resembled a horse-shoe in form. On the 28th reduced to small fragments.
- Feb. GROUP 44. *Long.* 335° to 329° . *Lat.* 13° to 15° N.
 23. Two insignificant spots followed by a third at some distance from E. limb.
 24. A little stream f.
 26. About six spots in two sets.
 27. Great increase, two large centres of activity.
 28. Two nearly normal spots connected by a chain of small ones.
- Mar. 1. Three spots, the p. nearly $1'$ of arc in major axis, the two f. much divided.
 2. The p. breaking up, the principal nucleus large and wedge-shaped, the f. altered in position, forming two double spots.
 3. The p. curved, the f. decreasing.
 4. More divided, one irregular spot f.
 5. Dwindling, bright faculæ close to the largest spot near the limb.
- Feb. GROUP 45. *Long.* 331° to 325° . *Lat.* 19° to 22° S.
 23-28. First seen as one spot, probably developed on the visible side of disc, afterwards a very small cluster.
- Feb. } GROUP 46. *Long.* 352° to 349° . *Lat.* 19° S.
 26- } A new outburst, a few little spots in two sets, afterwards another in
 Mar. } advance; when near limb one, rather larger.
 5. }
- Feb. GROUP 47. *Long.* 308° . *Lat.* 14° N.
 24- A normal spot, near the central meridian on March 2, major axis
 Mar. $40''$. Nucleus bridged on the three f. days. When near W. limb
 7. reduced.

- Feb. GROUP 48. *Long.* 305°. *Lat.* 6° S.
26-27. Two little spots widely separated.
- Feb. }
26- } GROUP 49. *Long.* 292°. *Lat.* 23° S.
Mar. } Two or three very small spots, at last reduced to one.
1. }
- Feb. GROUP 50. *Long.* 291° to 284°. *Lat.* 4° to 6° S.
26- A normal spot, increasing considerably after the 26th. On March 2
Mar. a stream of small spots and dots f. in a zigzag, which gradually
8. died out. The nucleus of the main spot underwent some changes
in outline, major axis 45'' on the 4th. On this date the Rev.
W. R. Waugh and another observer noticed glancing spear-like
tongues of a reddish hue for the space of half an hour. By the
7th it began to show signs of dismemberment.
- Mar. GROUP 51. *Long.* 244°. *Lat.* 20° N.
1-7. When near E. limb two little spots, afterwards more in number. On
the 3rd, one with penumbra. On the 7th, four, very small.
- Mar. GROUP 51A. *Long.* 240° to 235°. *Lat.* 17° to 19° S.
7-10. A stream of dots f. Group 51. On the 8th, two little spots, more
widely separated. On the 10th, almost gone.
- Mar. GROUP 52. *Long.* 192° to 183°. *Lat.* 13° to 23° N.
5-18. A few small spots near E. limb on the 5th. On the 7th, a scattered
cluster extending over a wide area, two spots only with penumbra.
On the 8th, three; the largest, the most f. normal, major axis 35''.
Many dots and outliers to the N., which gradually disappeared,
leaving the main spot solitary and normal after the 13th, until it
reached the W. limb.
- Mar. GROUP 53. *Long.* 173°. *Lat.* 11° N.
5-18. First observed on the 5th as a penumbral spot very near E. limb at
10.45. On the 7th, almost split in two, but re-united the following
day, nucleus divided. On the 11th circular, major axis 45'', the
nucleus in three leaf-like segments, afterwards closing up, but
again divided on the 16th. A small spot preceded on the 10th
and 11th. In many respects this spot resembled 52.
- Mar. GROUP 54. *Long.* 198° to 190°. *Lat.* 9° to 17° S.
10-16. Very small spots in two sets, N. and S. of each other, near the
centre of disk. On the 11th, increasing in number and area,
sharp in outline, those to the S. with a leader larger than the rest.
On the 13th, both sets in curved streams with several penumbral
spots in each, afterwards decreasing. On the 16th, the most f.
only visible.
- Mar. GROUP 55. *Long.* 118°. *Lat.* 5° to 6° N.
11-22. A normal spot, which showed little decided change. On the 14th, a
small portion detached, forming a separate spot, which proved of
short duration. On the 18th, major axis 35''. When near W.
limb the area was much the same as when near E. limb, the
penumbra a little wider on the p. side.
- Mar. GROUP 56. *Long.* 108°. *Lat.* 5° S.
16. A few dots at 9.50 a.m. At 3.45 p.m. one small spot. On the 17th,
a very small pair.
- Mar. GROUP 57. *Long.* 163° to 154°. *Lat.* 20° N.
15-19. On the 15th two small spots, then a little stream. On the 17th the
first and last spots increased. On the 18th, the leader with
double nucleus, major axis 45'', the last spot broken up. When
near W. limb on the 19th bright faculæ were observed between it
and the f. spot.

Mar. GROUP 58. *Long.* 146°. *Lat.* 12° S.

16-18. A small dark spot in the western hemisphere. On the 17th, a pair.

Mar. GROUP 59. *Long.* 54° to 56°. *Lat.* 6° to 10° S.

16. Two penumbral spots nearly equal in area, with 4° difference in latitude, the p. having a double nucleus.
17. The p. broken up and reduced.
18. Many more spots in a stream, expanding at the end, a mixture of nuclei and penumbra.
19. Some of the spots more confluent.
21. Immense increase, a large group extending over 9° in longitude, with a leading spot 1' of arc in length, the f. portion much subdivided and studded with small nuclei.
22. The leader a splendid spot, full of detail, with a "black hole" in the centre of the largest nucleus. The f. spots more contiguous, with an increase of penumbra disposed chiefly in curves.
24. Nucleus of leader double, the f. portion now attached to it. The f. spots dwindling.
25. Nucleus again more subdivided, with a large proportion of penumbra, the f. fewer and altered in position.
26. Leader divided, the f. much reduced.

Mar. GROUP 60. *Long.* 26° to 18°. *Lat.* 4° to 6° S.

19-29. Two small penumbral spots at some distance from E. limb where faculæ were observed on the previous day. On the 21st an immense increase took place in both spots, they were also inclined in opposite directions, with penumbra on opposite sides. On the 22nd the p. was almost normal, with two nuclei, the f. very complex, and with outliers, each spot about 50'' in major axis. After this date the p. became more irregular, being elongated and bridged in several places. On the 26th a small portion was detached. It then gradually decreased, was near W. limb at 9.30 on the 29th, and invisible at 3.15. The f. spot decreased continuously after the 24th, including also the outliers, and was finally reduced to two dots on the 27th.

Mar. GROUP 61. *Long.* 89° to 82°. *Lat.* 12° to 13° N.

21-22. At first only two small pairs, on the 22nd, larger, with another spot n. f.

Mar. GROUP 62. *Long.* 312°. *Lat.* 22° N.

25-27. An insignificant spot at some distance from E. limb, then a stream trending N.W. On the 27th, about eight little spots in a curve.

Mar. GROUP 63. *Long.* 295° to 285°. *Lat.* 16° to 19° N.

24- April 5. A small nebulous spot. On the 27th, more, in two sets; of these several in each set increased and had penumbra on opposite sides. On the 29th one of the leading spots was much larger than the rest, and ear-shaped, with nuclei curling round, the f. N. and S. of each other. On the 30th the leader was heart-shaped, a red flame was observed in it by the Rev. W. R. Waugh, while the f. had become a swarm of little spots and dots. On the 31st it was normal, major axis 1' of arc, and the f. fewer. On April 3 the nucleus was singularly divided, the f. were fast decreasing. When near W. limb on the 5th it was again more regular and the f. apparently reduced to one.

Mar. GROUP 64. *Long.* 289° to 281°. *Lat.* 6° to 9° S.

26- April 3. A very small spot in the midst of faculæ. On the 27th, more, in two sets. On the 29th, one of the f. increased in area, and was divided centrally, the rest forming little streams on either side. It afterwards decreased, became trifid, the streams vanishing. On April 3rd a trio of small spots close together alone remained.

- Mar. GROUP 65. *Long.* 249° to 243° . *Lat.* 8° N.
 29- At first a small cluster; on the 30th, one normal spot with a lesser
 April one f. On the 31st, two, nearly equal, about $30''$ in major axis,
 5. which became inclined in opposite directions, soon after April 1st
 breaking up and diminishing, and on the 5th were still more
 reduced.
- Mar. GROUP 66. *Long.* 200° . *Lat.* 20° S.
 31- On the 31st, a small penumbral spot near E. limb; on the 3rd, split
 April into three, then reduced to one. On the 7th, a stream wider in
 9. front; on the 9th, two nebulous spots only.
- April. GROUP 67. *Long.* 250° to 245° . *Lat.* 24° to 27° S.
 3-7. Three sets of small spots in a triangle, on the 4th, a few more in
 advance, the others fewer; finally reduced to two or three.
- April. GROUP 68. *Long.* 184° . *Lat.* 11° N.
 3-13. A penumbral spot where a faculous patch was observed on the 1st.
 Its greatest length was only about $20''$. The nucleus was at one-
 time cloven, at another double; after passing the central meridian
 it rapidly declined.
- April. GROUP 68A. *Long.* 191° to 189° . *Lat.* 4° to 6° N.
 7-13. A small stream to the S. of group 68. On the 9th, two larger spots,
 4° in longitude apart; the p. with penumbra confined to one side.
 On the 10th it became normal, with a portion detached. On the
 11th the two spots were nearly equal, major axis $40''$. When
 near W. limb, the p. had penumbra again only on the p. side;
 the f. was much reduced.
- April. GROUP 69. *Long.* 218° . *Lat.* 11° S.
 5-9. Some small spots in two sets, W. of the centre of disk, one showed
 a slight increase. On the 7th, two spots more widely separated.
 and lastly, a few nearer each other.
- April. GROUP 70. *Long.* 135° . *Lat.* 13° S.
 5-17. A penumbral spot, which showed remarkably little change, remain-
 ing normal throughout its course; on the 12th there were several
 outliers, on the 13th the nucleus was bridged, but did not remain
 so when near W. limb.
- April. GROUP 71. *Long.* 217° to 212° . *Lat.* 7° N.
 8-11. A few small spots in the western hemisphere; on the 9th one
 became much larger, with penumbra on the p. side only, as it
 neared the W. limb it rapidly declined and one companion only
 was left.
- April. GROUP 72. *Long.* 151° to 148° . *Lat.* 13° S.
 8-10. About four small spots in advance of group 70. On the 10th, a
 miniature stream.
- April. GROUP 73. *Long.* 157° to 154° . *Lat.* 18° to 19° N.
 10-13. Two or three nebulous spots near the central meridian, which died
 out one after the other.
- April. GROUP 74. *Long.* 73° to 62° . *Lat.* 8° to 11° N.
 10. An irregular spot, very near E. limb at 2.15.
 11. A train, the most f. double, much larger than the rest.
 12. Great change, two large spots with a smaller one, chiefly penumbral,
 between them. The p. in the form of a horseshoe.
 13. The p. more regular, the f. with two nuclei, a small spot 13° p. in
 longitude, latitude 16° N.
 14. Both nearly normal, a stream of very small spots between the
 two.

April.

GROUP 74—*continued*.

15. Nuclei of both spots bridged, the stream disappearing.
16. Nearly central; areas 1,500 and 800 square seconds respectively.
17. The p. equatorially inclined, the f. more vertical, nucleus very jagged.
18. Nucleus of p. double, the f. with three small spots to the S.
19. Both normal with double nuclei.
20. The p. less than half the size of the f., now very complex.
21. The p. still dwindling.

April.

GROUP 75. *Long.* 68° to 63° . *Lat.* 8° to 11° S.

- 10-23. When near E. limb a penumbral spot. A small pair to the N. On the 13th, nearly circular but compound, with major axis $40''$; a change then took place and it rapidly decreased. On the 15th there were three spots widely separated; on the 16th, more than double the number in a stream, several with penumbra; a spot at the rear afterwards increased, the stream widening. On the 20th, two principal spots, the p. the smaller of the two, both being very compound and surrounded with dots.

April.

GROUP 76. *Long.* 78° to 75° . *Lat.* 19° to 26° S.

- 11-15. A very small spot at some distance from E. limb. On the 12th, two, N. and S. of each other; on the 13th, two little pairs to the S. in addition. They quickly disappeared, leaving only one spot.

April.

GROUP 77. *Long.* 122° to 117° . *Lat.* 3° N.

- 12-16. A little stream near the central meridian. On the 14th, a few more, forming a circle.

April.

GROUP 78. *Long.* 103° . *Lat.* 7° S.

- 15-16. Two or three little spots past the centre of disk. On the 16th, one, very small.

April.

GROUP 79. *Long.* 38° . *Lat.* 16° S.

17. A small spot in the eastern hemisphere.

April.

GROUP 80. *Long.* 53° to 50° . *Lat.* 16° to 17° S.

18. Two small spots past the central meridian.

April.

GROUP 81. *Long.* 338° . *Lat.* 11° N.

- 19-20. A few little spots p. Group 82.

April.

GROUP 82. *Long.* 326° to 315° . *Lat.* 15° to 20° N.

19. A penumbral spot.
20. A swarm of little ones f.
21. Spots more equal in area.
23. The p. arranged in the form of a quatrefoil, the f. in a fragmentary cluster.
24. Area 2,000 square seconds, many sputterings now connect it with the f. spots.
25. Details wanting.
26. The p. elongated, with numerous small nuclei, the f. reduced to about two spots.
27. Much broken up at the rear.
28. More normal, nucleus bridged, a double stream closely f.
29. Nucleus more divided, with penumbra on the p. side f. stream thinned.
30. Near W. limb.

April.

GROUP 83. *Long.* 308° to 304° . *Lat.* 20° to 23° N.

20. A large spot near E. limb. (See illustration.)
21. Nearly normal, two smaller spots f.
23. Area 2,000 square seconds, a large black hole in the centre of nucleus.
24. See remarks in the Introduction for details of the main p. spot. The largest of the f. with penumbra on one side.

- April. GROUP 83—*continued*.
 25. The large spot double.
 26. Main spot more normal.
 27. Outline circular, the f. spot still one-sided.
 28. Penumbra with a branch to the N.
 29. Nucleus fimbriated; black hole still visible.
 30. Two spots f.
 May.
 1. Penumbra rather wider on the f. side.
 2. Very near limb.
- April. GROUP 84. *Long.* 292° to 289° . *Lat.* 8° to 10° N.
 21-29. A few very small spots f. Group 83, which varied a little in number.
- April. GROUP 85. *Long.* 8° to 2° . *Lat.* 12° to 19° S.
 21-25. A very small spot near the central meridian. On the 23rd, a pair. On the 24th, a stream, curving to the S. On the 25th, again a pair.
- April. GROUP 86. *Long.* 278° . *Lat.* 10° N.
 24-25. A few small spots, which increased in number, and then died away.
- April. GROUP 87. *Long.* 297° to 292° . *Lat.* 13° S.
 25- Two spots not far from the centre of disk. On the 27th, a stream,
 May the constituents afterwards increasing in area. On the 28th the
 2. leader was almost normal. On the 30th the most f. was the largest, but did not so continue. When nearing W. limb no very decided change took place.
- April. GROUP 88. *Long.* 247° to 237° . *Lat.* 24° to 27° S.
 25- A penumbral spot with one or two smaller ones f.; on the 27th it
 May was surrounded with faculae; on the 28th two spots were conspicuous; by the 30th they had increased in number but decreased in area, and a small pair only remained on May 1.
- April. GROUP 89. *Long.* 230° to 220° . *Lat.* 11° to 13° N.
 26- Two penumbral spots near E. limb. On the 27th, the p. normal
 May with a few outliers. On the 28th, a stream, the p. the largest, some of the f. then increased a little. On May 1, in three sets, but when last observed decreasing.
- May. GROUP 90. *Long.* 194° . *Lat.* 10° S.
 1-3. A small spot at some distance from E. limb, on the 3rd more, in a scattered stream.
- May. GROUP 91. *Long.* 264° . *Lat.* 6° .
 1-4. A few very small spots past the central meridian on the 1st. The observations afterwards obtained are rather untrustworthy, but one small spot seems to have been still visible on the 4th.
- May. GROUP 92. *Long.* 224° . *Lat.* 7° N.
 4-7. A small spot in the western hemisphere. On the 7th another was observed in Lat. 5° N. in nearly the same longitude.
- May. GROUP 93. *Long.* 143° to 137° . *Lat.* 13° to 16° S.
 3. Two penumbral spots with irregular nuclei.
 4. The penumbra of each on opposite sides.
 5. Both more normal and nearly equal in area, nuclei irregular; dots and outliers between.
 6. Area (of both) 1,800 square seconds; the f. breaking up.
 7. Nucleus of p. widely bridged, the f. becoming fragmentary.
 8. The p. with nucleus entire, but pointed to the S. The f. decreasing.
 9. Nucleus of p. again bridged; the f. much decreased.

May. GROUP 93—*continued*.

- 10. Normal, circular, the f. almost gone.
- 11. Nucleus much divided.
- 13. Broken up on the f. side.
- 14. Near W. limb.

May. GROUP 94. *Long.* 190° to 186°. *Lat.* 8° N.

- 7-8. A cluster of very small spots in the western hemisphere, which soon disappeared.

May. GROUP 95. *Long.* 69°. *Lat.* 7° S.

- 8-9. A dot near E. limb, on the 9th a small close pair.

May. GROUP 96. *Long.* 87°. *Lat.* 8° N.

- 10-12. Two very small spots, reduced afterwards to one.

May. GROUP 97. *Long.* 93° to 91°. *Lat.* 16° S.

- 12. A small pair near the centre of disk.

May. GROUP 98. *Long.* 19° to 10°. *Lat.* 15° to 19°.

- 12-18. A scattered stream of small spots, which increased a little in number and area on the 14th. They were preceded by two more on the 16th, and disappeared soon after passing the central meridian.

May. GROUP 99. *Long.* 70°. *Lat.* 11° S.

- 13. A small spot nearly on the central meridian in almost the same position as Group 95; not seen on the 10th, 11th, and 12th.

May. GROUP 100. *Long.* 357°. *Lat.* 13° N.

- 14. Two spots near E. limb.
- 15. A little train, the first and last spot penumbral.
- 16. Leader ear-shaped.
- 17. Nucleus divided.
- 18. Normal.
- 19. Diameter about 50'', one f. spot only penumbral.
- 20. The f. disappearing.
- 21. Nucleus double.
- 22. Split in twain. The f. gone.
- 23. Further apart.
- 24. Near W. limb.

May. GROUP 101. *Long.* . *Lat.* S.

- 19. Two little spots with about 6° difference in longitude near W. limb.

May. GROUP 102. *Long.* 344° to 337°. *Lat.* 8° to 10° N.

- 18. Small spots and dots f. Group 100.
- 19. Three of them with slight penumbra.
- 21. More scattered.
- 22. More confluent, with many little nuclei.
- 23. The p. in a stream.
- 24. Increasing in area.
- 25. The leader larger than the rest. A sweep of faculæ n. f.

May. GROUP 103. *Long.* 300° to 297°. *Lat.* 17° to 21° S.

- 17. A considerable spot near E. limb.
- 18. Normal.
- 19. Form more irregular.
- 20. Little change.
- 21. A small spot f.
- 22. Oval, nucleus bridged at the end.
- 23. Parallel to the equator, major axis 1' 5''. Nucleus more irregular, outliers circling round on the S. side.
- 24. A portion at the extremity detached. Outliers to the S. and s. f. immensely increased, curving round and beginning to form distinct spots.

May. GROUP 103—*continued*.

25. Nucleus forked, outliers stretching upwards and loosely connected together with many little nuclei and patches of penumbra exceeding in area the large spot itself.
26. Nucleus wedge-shaped, the thick end darker in tint; outliers thinning but still sweeping round to the S.
27. Nucleus curving eastward, outliers wonderfully perforated with many dots, and still in a chain-like connexion.
28. Main spot in two portions, penumbra on the p. side, the chain of spots also more divided, with their penumbra chiefly on the f. side.
29. Fewer small nuclei in the chain.
30. Only two of the f. spots seen near W. limb at 8 a.m.

May. GROUP 104. *Long.* 298°. *Lat.* 13° S.

- 19-25. A nebulous spot, which showed little change, decreasing very gradually.

May. GROUP 104A. *Long.* 296° to 290°. *Lat.* 18° to 21° S.

23. A cluster of very small spots.
24. Great increase in number and area.
25. More stream-like, one of the leading spots larger than the rest.
26. Fast decreasing, the remaining spots more widely separated.
27. Only two or three left.
28. Almost gone, a stretch of faculæ f.

May. GROUP 105. *Long.* 279°. *Lat.* 1° N.

- 19-30. One or two small spots when near E. limb, one increased considerably and became normal, with major axis 30'' on the 23rd. The nucleus, varied somewhat in form, was cloven on the 27th and 28th, bridged on the 29th, but apparently entire when nearing the limb with penumbra on the p. side.

May. GROUP 106. *Long.* 273°. *Lat.* 25° S.

- 20-31. When near E. limb a considerable spot with smaller ones f., which gradually disappeared. It was nearly normal throughout its course, with but little variation in area; major axis 45'' on the 23rd. When nearly central it showed signs of breaking up at the extremity and the nucleus of dividing.

May. GROUP 107. *Long.* 229°. *Lat.* 3° N.

- 23-30. A small nebulous spot, which did not increase in area. On the 29th. a scattered stream of small spots, finally a wide pair.

May. GROUP 108. *Long.* 239° to 230°. *Lat.* 12° to 17° N.

24. A few small spots in advance of Group 107.
25. A stream, condensed in front and expanding at the rear.
26. Increasing in area.
27. Constituents very numerous.
28. Many with slight penumbras, stream more curved at 6.20 p.m., dots intermingled.
29. First and last spots larger than the rest. At 6 p.m. spots varying in position, some dots in a miniature stream at the rear.
30. Decreasing in number and area, those in the middle dying out.
31. Fast disappearing, one spot only penumbral.

June.

1. Still fewer.
2. One spot.

May. GROUP 109. *Long.* 189°. *Lat.* 7° S.

- 27- When near E. limb a small penumbral spot, which rapidly dwindled.
- June. A smaller one preceded it on the 28th, both which disappeared.
1. soon after passing the central meridian.

May } GROUP 110. *Long.* 148°. *Lat.* 13° S.

- 29- } A few very small spots.
- June }
2. }

May } GROUP 111. *Long.* 194°. *Lat.* 16° S.
 31- } A small cluster of diminutive spots. On the 2nd in two sets.
 June 2. }

May. GROUP 112. *Long.* 120° to 115°. *Lat.* 13° to 17° N.
 31- An irregular stream of many small spots and dots, only a few with
 June penumbra. They gradually died out, and were last seen as a little
 8. cloud of dots.

June GROUP 113. *Long.* 104° to 96°. *Lat.* 12° to 14° S.
 1-7. Another stream of small spots and dots, but on a smaller scale—
 than 112, hardly any with penumbra; on the 5th in a zigzag.

June. GROUP 114. *Long.* 101°. *Lat.* 18° N.
 5. A few little spots, in two sets, f. Group 112.

June. GROUP 115. *Long.* 151° to 144°. *Lat.* 11° to 13° S.
 4. A stream of very small spots near the centre of disk.
 5. In two sets, two spots with penumbra, the most f. increasing between
 8 a.m. and 6 p.m., with small dark nuclei.
 6. The p. all small, in a zigzag, the f. still increasing, but with signs
 of division.
 7. The p. dwindling. Large spot split in twain, faculous light between
 the two, major axis about 40".
 8. Penumbra of large spots almost confined to the f. side.
 9. Bright faculae only p. The S. portion of the f. only left.

June. GROUP 116. *Long.* 84°. *Lat.* 18° S.
 3-15. A normal spot, without attendants, showing but little change, except
 some unimportant variations in the form of the nucleus. Major
 axis on the 7th, 35".

June. GROUP 117. *Long.* 52° to 38°. *Lat.* 12° to 17° S.
 5. A considerable spot very near E. limb at 6 p.m.
 6. A train, the leading spot larger than the rest.
 7. Five of the spots with penumbra.
 8. All larger and more numerous.
 9. Spots in two sets, rapidly changing, those in the first almost united,
 in the second smaller, curving to the S.
 10. A large leading spot, with many smaller and very irregular ones—
 closely f. those at the rear decreasing and less curved.
 11. Leader elongated, nucleus large and dense f. spots changing and
 decreasing, with sharp nuclei.
 12. Nucleus of leader bridged, the spots closely f. again coalescing.
 The more distant on the wane.
 13. The f. spots, with many small nuclei, curving round at the end.
 Some new outliers to the S.
 14. Leader kite-shaped, the f. spots decreasing; one of the more distant
 only left.
 15. The f. spots more numerous and altered in position; the distant one
 in fragments.
 16. Fewer spots f.
 17. Near W. limb; one spot.

June. GROUP 118. *Long.* 171°. *Lat.* 8° to 9° S.
 5. A pair of very small spots in the western hemisphere.

June. GROUP 119. *Long.* 57°. *Lat.* 18° N.
 8-12. A few little spots varying in number and position, when first
 observed 33° E. of centre. On the 9th they formed a trapezium,
 but were finally reduced to one.

June. GROUP 120. *Long.* 351° to 341° . *Lat.* 6° to 16° N.

9. A very small spot near E. limb, not seen at 8 a.m.
10. Two normal spots; the p. the larger.
11. Little change.
12. The f. with penumbra on the n. f. side; a few outliers.
13. The f. immensely increased and become double, with several nuclei, and a large amount of penumbra.
14. The large spot more normal, with a portion detached, changes taking place and radiations in the penumbra clearly visible; a new spot n. f. at 6.15 p.m.
15. A considerable group, numerous spots to the N. See illustration.
16. Nucleus forked at 8 a.m., but straight at 5.50 p.m., the outliers to the S. spreading equatorially, spots to the N. in two sets containing a multitude of small nuclei, which became more consolidated in the p.m.
17. Nucleus pointed towards the W. in an opposite direction to that of yesterday.
18. More circular; major axis nearly $1' 30''$, N. spots enlarged.
19. Still more circular, N. spots elongated, the most p. with a series of small nuclei.
20. All spots more broken up; fewer outliers.
21. Two principal spots, both double, those most f. quite fragmentary.
22. One spot, very near W. limb at 6 p.m.

June. GROUP 121. *Long.* 311° to 303° . *Lat.* 19° to 21° N.

- 13-25. At first a number of small scattered irregular spots. After the 16th two only were conspicuous, the most f. gradually decreased and disappeared, leaving the p. solitary; it was normal and circular when central, major axis $30''$. When nearing E. limb the nucleus had become two-lobed, penumbra wider on the p. side. Prof. Pereira remarks that "the saucer shape is evident."

June. GROUP 122. *Long.* 273° . *Lat.* 22° S.

- 16-26. A normal spot, not exceeding $30''$ in major axis, which gradually dwindled after passing the central meridian. The nucleus was double on the 18th, triple on the 23rd. On the 25th, again double, but without penumbra, finally single and very small. Faculae alone remaining on the 27th.

June. GROUP 123. *Long.* 249° to 241° . *Lat.* 8° to 17° N.

18. Three little spots not far from E. limb.
19. Spots united. Penumbra on the f. side at 8 a.m., on both sides at 6.10 p.m. with more nuclei.
20. Several small followers and a spot 5° to the S.
21. Main spot with large nucleus pointed and shaded off to the S., faculous light between it and the small nuclei. S. spot gone.
22. Nucleus still pointed and shaded off, a swarm of small nuclei streaming eastward forming a double stream.
23. Nearly central, nucleus still shaded off, the f. spots in a zigzag, new ones further off, very faint. Three to the S.
24. Faculous light again between the large nucleus and the small ones now circling round it on the n. f. side. The f. spots altered in position.
26. Nucleus balloon-shaped, small ones n. f. more scattered. The distant fewer and more widely separated.
26. Main spot dividing.
27. Nucleus smaller and more circular; the peculiar feature of the small nuclei, as it were, hanging on at the rear, still preserved. No outliers.
28. Little decided change.
29. Very near W. limb.

June. GROUP 124. *Long.* 175°. *Lat.* 10° N.

- 23-30. A small normal spot near E. limb on the 23rd, a bright patch of faculae to the S. It showed little change, not exceeding 25'' in major axis, was without penumbra on the 30th, dying out when not far past the centre of disk.

June. GROUP 125. *Long.* 259°. *Lat.* 13° S.

- 24-27. A few little spots in the western hemisphere, at first in the form of a triangle, but changing rapidly, and increasing in number; on and after the 23rd two spots only were seen.

June GROUP 126. *Long.* 166°. *Lat.* 11 S.

- 24- At first one small spot only, then more in number, with slight
July penumbra; on the 26th, in a stream; on the 27th, in two sets,
1. reduced at last to one spot with a double nucleus.

June GROUP 127. *Long.* 183° to 179°. *Lat.* 8° to 13° S.

- 26- A few small spots, p. Group 126, a new outburst, two of them
July increased a little. On July 1, one was normal, major axis 20'', a
3. trail of dots f. Both had diminished when last seen on July 3.

June GROUP 128. *Long.* 132°. *Lat.* 10° S.

- 29- A sudden outburst; one spot nearly normal, major axis 25'' pre-
July ceded by a smaller one. On the 30th about five spots in a stream,
5. apparently the normal one ruptured. On July 1, the final spot only with penumbra, the p. hardly larger than dots. After this it decreased, and was reduced on the 5th to three small spots in a triangle.

June GROUP 129. *Long.* 77°. *Lat.* 17° S.

- 30- A small penumbral spot, near E. limb on the 30th, it showed very
July little increase, not averaging more than 15'' major axis, and
10. gradually became smaller and more nebulous.

July. GROUP 130. *Long.* 52. *Lat.* 11° to 15° N.

- 2-9. On the 2nd, a considerable spot near E. limb, on the 3rd, double; on the 4th, four small ones, lying N. and S. of each other which became fewer and fainter.

July. GROUP 131. *Long.* 49°. *Lat.* 15° S.

- 3-9. A double spot with penumbra confined to the p. side. On the 6th, with four small nuclei in a row, area 300 square seconds, after the 7th it dispersed; when last observed, not far W. of the central meridian, it consisted of two little spots only, widely separated.

July. GROUP 132. *Long.* 52° to 35°. *Lat.* 6° to 11° S.

7. Three small spots in a triangle, n. f. Group 231, about one day from the centre of disk.
8. More in number, one with penumbra.
9. Immense increase, too large compound spots with small ones, and sputterings between.
10. Both nearly 1' in major axis, nuclei angular and divided.
11. Nucleus of the f. more elongated, intermediate spots larger, and a curved stream almost contiguous.
12. The f. spot dividing, both in form more leaf-like, the intermediate changing; stream more than half obliterated.
13. The p. now the larger, normal, but with several nuclei, the rest in pairs and more equal in area.
14. Three principal spots, the p. close to limb at 7.15 p.m.
15. The most f. visible at 4.20 p.m.

July. GROUP 133. *Long.* 119°. *Lat.* 16° S.

- 6-8. A few fragmentary spots in the western hemisphere, on the 7th, rather more in number.

July. GROUP 134. *Long.* 2°. *Lat.* 6° S.

- 6-18. A small spot very near E. limb at 10.24 a.m. on the 6th. On the 7th, several, two of which apparently united and became a normal spot with major axis 35'' on the 9th. The smaller ones f. gradually died out, leaving the leader for the most part solitary. On the 12th, elongated and bridged. On the 13th, breaking up at the extremity, major axis 45''. Afterwards normal.

July. GROUP 135. *Long.* 358° to 353°. *Lat.* 12° to 16° N.

6. A spot very near E. limb at 10.24 a.m., not seen at 7.30 a.m. (Region of Group 120, accounting for the appearance and disappearance of small spots in the neighbourhood.)
 7. Normal, stragglers at some distance N. and S.
 8. Nucleus divided, a new spot about 20° in advance.
 9. Breaking up at the eastern extremity, advanced spot gone, also those N. and S.
 10. Major axis 30'', one or two distant outliers n. f.
 11. One-sided, nucleus double, two new spots to the S., two more p.
 12. Main spot decreasing, more small ones forming a triangular cluster; those n. p. gone.
 13. Past centre, decreasing in number and area.
 14. Very scattered. *Long.* 356° to 345°. *Lat.* 11° to 17° N. A new spot to the N., and a larger nebulous one f.
 15. In three sets, fewer and widely separated; the original group nearly gone.
 18. A small spot near limb.

July. GROUP 136. *Long.* . *Lat.* N.

8. A few very small spots (further from W. limb than Group 133).

July. GROUP 137. *Long.* 87° to 83°. *Lat.* 16° N.

- 9-11. Two or three very small spots about half of radius from centre.

July. GROUP 138. *Long.* 335°. *Lat.* 13° N.

- 9-11. Two little spots f. Group 135, reduced to one on the 11th.

July. GROUP 139. *Long.* 301°. *Lat.* 25° N.

11. Two small spots near E. limb widely separated; the f., although the larger, was the first to disappear; the p. increased a little on the 14th, appearing nebulous.
 23. On the 20th and 21st there were about five very small spots after being invisible for two days. When near W. limb with slight penumbra.

July. GROUP 140. *Long.* 295°. *Lat.* 15° S.

- 13-22. Three little spots at some distance from E. limb in the form of a triangle, on the 14th, two, much larger; the p. more than double the size of the f., which gradually disappeared. The p. became normal, and at last solitary, with major axis 30'' on the 19th. It decreased before reaching the W. limb.

July. GROUP 141. *Long.* 274°. *Lat.* 11° S.

- 13-18. A small penumbral spot near E. limb. On the 17th, two. On the 18th, one only.

July. GROUP 142. *Long.* . *Lat.* N.

23. One very small spot 20° or 30°, n. p. 143.

July. GROUP 143. *Long.* 200° to 197°. *Lat.* 17° N.

- 23-24. Two little pairs on the 23rd, about one day E. of centre.

July. GROUP 144. *Long.* 136° to 127° . *Lat.* 9° to 16° S.

24. A very small spot near E. limb.
 26. A little stream.
 27. More in number, the most f. much larger, nearly normal, major axis nearly $30''$.
 28. Spots in three sets, inclined less than usually to the equator; one of the p. increased; the third set new.
 29. One of the third set larger, with penumbra on one side only. Middle spot with double nucleus, a few outliers between them.
 30. The p. very much reduced, mid-spot elongated, final with two nuclei.
 31. All decreasing.
- Aug.
1. Hardly more than dots.
 2. One very small spot.

July. GROUP 145. *Long.* 168° to 165° . *Lat.* 15° N.

- 26-29. Four little spots in a trapezium not far from the centre of disk; on the 28th, in a stream, lastly one spot more W.

July. GROUP 146. *Long.* 166° . *Lat.* 13° S.

27. A small spot past the central meridian.

July. GROUP 147. *Long.* 62° . *Lat.* 7° S.

- 29- Aug. A normal circular spot, major axis about $30''$, penumbra on the 31st wider on the p. side. On August 8 chiefly confined to the S., otherwise it showed little change.

July. GROUP 148. *Long.* 83° to 73° . *Lat.* 9° S.

30. A few very small spots p. 147.
 31. Enormous increase, a train, almost a zigzag, the most p. and the most f. spots larger than the rest. Many sputterings.
- Aug.
1. Spots more in two sections, leader $45''$ major axis, with large dense nucleus, fragments streaming eastward, the f. spots more confluent.
 2. Leader elongated, streams also more drawn out and ending in dots. The f. becoming merged into an equally large spot.
 3. Leader with nucleus severing, a separate spot at the extremity. The f. helical with penumbra exterior only.
 4. Leader more bridged, adjacent spot without penumbra, the f. more equatorial.
 5. Outliers disappearing.
 6. Nuclei of leader trident-shaped, the f. still helical, both spots now quite distinct, nearly equal in area and distance apart.
 7. Leader more broken up, nuclei of both decreasing.
 8. Leader nearly normal, nucleus double, the f. one-sided, with small nuclei p. as if detached.
 9. The f. only visible at 9 a.m.; much decreased.

Aug. GROUP 149. *Long.* 98° . *Lat.* 14° S.

- 1-2. A few dots near the central meridian, lastly two little spots.

Aug. GROUP 150. *Long.* 27° to 13° . *Lat.* 7° to 12° N.

1. A penumbral spot near E. limb, a smaller one to the N.
2. Normal, many spots f.
3. A train, the leader normal, the rest very small; the train, as it were, broadcast and mixed with dots.
4. No great change.
5. Leader very compound, curved; the rest still fragmentary and wispy.
6. Nearly central, spots still more numerous and larger, but the leader by far the most important, opening at the rear; a bright central space at 11.30 a.m., which became filled up at 5.45 p.m., small nuclei streaming from it.
7. Leader with nucleus entire, but much fimbriated, length $1' 10''$, width $1'$. The f. spots also larger and more confluent.

Aug. GROUP 150—*continued*.

8. Signs of cleavage in large nucleus, the f. in a double stream. A very strong reversal of the C. line in the spectrum just S. of the nucleus, and also in various other parts of the group.
9. Leader still increasing but less jagged, "black hole" in the southern part of nucleus, the f. decreasing.
10. Nucleus of leader bridged.
11. A portion of the leader detached, the f. spots dying out.
12. Near limb, nucleus two-lobed, a great preponderance of penumbra on the f. side.
13. Only the f. spot visible at 1 p.m.

Aug. GROUP 151. *Long.* 54° to 47° . *Lat.* 4° to 10° S.

- 2-10. On the 2nd, a tiny cluster which increased rapidly in 24 hours, having then two leading spots close together and others following, which also increased both in number and area. On the 6th there were seven spots with more or less penumbra; the f. gradually disappeared, the leaders separating, the larger after some change becoming normal with major axis $40''$ on the 7th.

Aug. GROUP 152. *Long.* 3° . *Lat.* 7° S.

- 2-13. A small penumbral spot, near E. limb on the 2nd, which increased a little in area before reaching the central meridian with major axis $30''$, but decreasing afterwards. On the 6th, two spots were seen in advance.

Aug. GROUP 153. *Long.* 10° to 6° . *Lat.* 16° S.

- 3-10. An insignificant group to the S. of 152, consisting of a few fragmentary spots; on the 6th, in two sets, with slight penumbra. On the 10th, reduced to dots.

Aug. GROUP 154. *Long.* 341° to 335° . *Lat.* 16° N.

- 3-16. A penumbral spot near E. limb on the 3rd, another to the N., closely connected and forming a singular arm-like projection on the 6th, which dispersed in 24 hours, leaving the main spot normal, major axis from $40''$ to $45''$. The nucleus varying a little in form. It was attended by numerous small outliers after the 5th, forming a stream curved at the upper extremity on the 9th, at the lower on the 11th, sweeping round in a circle on the 12th, and finally disappearing.

Aug. GROUP 155. *Long.* 360° . *Lat.* 15° to 16° N.

- 11-14. A new outburst of small nuclear spots 35° E. of centre, the leader became larger than the rest and normal, the f. decreased.

Aug. GROUP 156. *Long.* 268° . *Lat.* 14° S.

- 11-14. Two very small spots not far from E. limb on the 11th, faculae were observed on the 10th.

Aug. GROUP 157. *Long.* 261° . *Lat.* 7° N.

12. A few little spots at some distance from E. limb.

Aug. GROUP 158. *Long.* 202° to 190° . *Lat.* 15° to 19° N.

14. A considerable spot near E. limb.
15. Another f.
16. Major axis $1'$ of arc, not including the f. portion, now curving round and studded with small nuclei.
17. More sputterings at the extremity; f. spot normal.
18. Forked at the end, at 5.30 p.m. a section of the head paler in tint (see "British Astronomical Association Journal," Vol. V. p. 214), the f. spot more angular.
19. Nucleus bridged, with conspicuous black hole in the p. part, penumbral patches at the extremity; the f. spot with curved nucleus.

Aug.

GROUP 158—*continued*.

20. Pear-shaped, a portion severed and studded with small nuclei ending in a stream of dots; the f. spot dividing.
21. Nearly central; severed portion in fragments, the f. also more broken up.
22. More normal.
23. Major axis 45'', nucleus curiously lobed; the f. one-sided.
24. Breaking up; two f. spots.
25. Almost split in twain, diminishing, and with no outliers.
26. Near limb.

Aug. GROUP 159. *Long.* 220° to 213°. *Lat.* 6° to 9° N.

14. Two small spots s. p. 158.
15. Little change.
16. A cluster of little spots, some with slight penumbra.
17. Great change at 8 a.m., a complete spot p. with six small nuclei forming almost a circle with a vacancy in the centre; at 12, more pronounced, another compound but smaller spot f.
18. At 8 a.m. leader dividing, the f. also divided and enlarged. At 5.45 further change.
19. Spots forming a little train, an attracting force seems to have taken place among some of the foremost; penumbra tending to angularity.
20. Three of the p. spots distinct, curving, the f. altered in position.
21. Decreasing, nuclei much smaller, the f. spots broken up.
22. The p. spots circling round each other, the f. nearly gone.
23. Group preceded by a distinct patch of faculæ. The f. quite gone.

Aug. GROUP 160. *Long.* 208°. *Lat.* 21° S.

16. A small nebulous spot at some distance from E. limb.

Aug. GROUP 161. *Long.* 289°. *Lat.* 21° S.

17. Two little nebulous spots in the W. hemisphere; a bright patch of faculæ, n. p.

Aug. GROUP 162. *Long.* 219°. *Lat.* 11° S.

- 17-18. A dark little spot at 11.30 a.m., n. f. 160, not seen at 8.15 a.m.

Aug. GROUP 163. *Long.* 211° to 205°. *Lat.* 22° to 26° S.

- 24-26. A loose cluster of about 7 small spots, on the 25th fewer; N. and S. of each other when nearing W. limb.

Aug. GROUP 164. *Long.* 78°. *Lat.* 10° S.

- 24-26. A normal spot, a return of 147, which showed some inconsiderable changes in the nucleus and disappeared before reaching the W. limb; on the 31st the major axis was about 30''.

Aug. GROUP 165. *Long.* 149°. *Lat.* 10° S.

- 25-28. A few little spots in the western hemisphere; on the 28th, one only.

Aug. GROUP 166. *Long.* 60°. *Lat.* 6° S.

- 25-29. A small penumbral spot near E. limb on the 25th. It rapidly decreased. On the 28th, two spots.

Aug. GROUP 167. *Long.* 54° to 51°. *Lat.* 9° to 14° S.

- 27-29. Several very small spots at a little distance from E. limb, which increased in area and resulted in two principal spots with a few small outliers. The most northerly on the 30th was 35'' major axis, the southerly 15''. The northerly decreased, the nucleus becoming double, and by September 5 was quite solitary.

- Aug. GROUP 168. *Long.* 27° to 23° . *Lat.* 9° to 12° N.
 27- A large spot near E. limb at 8 a.m. A return of Group 150. On
 Sept. August 27 with double nucleus, the penumbra apparently wider
 9. on the p. side, which was not the case afterwards. On the 30th,
 one or two thread-like streamers from the N. part of the nucleus.
 September 1, nucleus entire, although fissured, the radiations in
 penumbra distinct. Diameter $66''$, or 30,240 miles. After
 September 2, the nucleus was bridged, and, when much fore-
 shortened, quadrangular. On the 9th, very near W. limb at 8.10.
 Penumbra equal on both sides.
- Sept. GROUP 169. *Long.* 345° . *Lat.* 22° N.
 1-2. A small spot at some distance from E. limb, on the 2nd a few more,
 N. and S. of each other.
- Sept. GROUP 170. *Long.* 322° . *Lat.* 11° N.
 2-9. When near E. limb, a few irregular spots, one of which increased a
 little on the 7th, becoming a pair, in diameter about $10''$ each.
 The most f. after almost disappearing again became united to the
 p. When near W. limb very small.
- Sept. GROUP 171. *Long.* 355° . *Lat.* 18° N.
 5. Two very small pairs, not far from the central meridian.
 6. Great increase, several penumbral spots in two sets.
 7. The most northerly spot normal, curved, major axis $35''$. Those to
 the S. fragmentary.
 8. N. spot with two nuclei.
 9. The f. waning.
 10. Decreasing.
 11. Very small.
- Sept. GROUP 172. *Long.* 257° to 248° . *Lat.* 7° to 10° N.
 6-18. A stream of little spots, widely separated, except on the 15th, when
 they formed almost a zigzag, chiefly pairs; one only attained $30''$
 in major axis. When last observed near W. limb one small spot
 only was visible.
- Sept. GROUP 173. *Long.* 273° to 265° . *Lat.* 15° S.
 7-10. A miniature stream, spots without any penumbra.
- Sept. GROUP 174. *Long.* 215° . *Lat.* 22° S.
 11-15. A very small penumbral spot near E. limb, which soon disappeared.
- Sept. GROUP 175. *Long.* 304° to 293° . *Lat.* 22° N.
 12-15. A few little spots in two sets in the western hemisphere, the first
 and last with a little penumbra.
- Sept. GROUP 176. *Long.* 247° . *Lat.* 24° N.
 13-15. A nebulous spot near the central meridian. On the 15th, a few dots.
- Sept. GROUP 177. *Long.* 224° to 218° . *Lat.* 9° N.
 13-18. Some little spots in two sets, rather resembling 175. They varied in
 number and area, and became a stream with only small spots
 on the 16th; on the 18th two had much increased, the rest
 disappearing.
- Sept. GROUP 178. *Long.* $^{\circ}$. *Lat.* $^{\circ}$ S.
 15. Two very small spots, hardly more than dots, not far from the
 centre of disk.
- Sept. GROUP 179. *Long.* 261° to 258° . *Lat.* 17° to 18° S.
 16. Two little spots 56° and 53° W. of central meridian.

- Sept. GROUP 180. *Long.* 201°. *Lat.* 24° N.
 16. Another diminutive short-lived group, a trio of tiny spots, with a few scattered dots much further N. in nearly the same position as Group 158.
- Sept. GROUP 181. *Long.* 128°. *Lat.* 16° S.
 16-28. A large penumbral spot, near E. limb, on the 16th, chiefly remarkable for having a severed portion, at first partially, afterwards entirely; when nearing W. limb the main spot was more broken up, major axis, on the 22nd, 45".
- Sept. GROUP 182. *Long.* 180° to 173°. *Lat.* 11° to 18° S.
 20-24. An irregular little stream about 2 days W. of central meridian. After increasing in number on the 21st the spots collected in two sets, as if larger were in course of formation, without any between them; on the 23rd they were still incipient, with dots close to the nuclei. Smothered with faculæ on the 24th.
- Sept. GROUP 183. *Long.* 151° to 149°. *Lat.* 16° N.
 20. A few insignificant spots and dots, near the central meridian.
 21. On the 21st, fewer and smaller, and with a new one f. at some distance.
- Sept. GROUP 184. *Long.* 114°. *Lat.* 18° S.
 20-22. A few very small spots s. f., 181. One only seen on the 21st, two, more widely separated, on the 22nd.
- Sept. GROUP 185. *Long.* 85° to 82°. *Lat.* 1° N.
 21-26. Another diminutive group; on the 21st a tiny pair near E. limb, streams of faculæ n. f. On the 24th more little spots in two sets, reduced to one on the 26th.
- Sept. GROUP 186. *Long.* 148°. *Lat.* 9° S.
 24. Two very small spots in the western hemisphere n. p., 181.
- Sept. GROUP 187. *Long.* 27°. *Lat.* 10° N.
 24- A large spot, penumbra nearly equal E. and W. when near limb, a return of 168.
 Oct. 5. The nucleus showed some slight changes; on the 29th it became bridged, but when near W. limb this was not observable. When nearly central length 1', breadth 55".
- Sept. GROUP 188. *Long.* 120°. *Lat.* 12° N.
 23-25. A pair of very small spots a little W. of centre; on the 25th one.
- Sept. GROUP 189. *Long.* 357° to 6°. *Lat.* 11° to 16° N.
 25. A very small spot near E. limb.
 26. More f. with slight penumbra.
 27. Two spots in course of formation.
 28. Two very compound spots, nuclei small and irregular, many outliers.
 29. Both more normal, outliers still more numerous.
 30. Major axis of each nearly 45", nuclei in bars, outliers increasing in area.
- Oct. 1. The f. spot entirely broken up, the fragments forming part of the f. stream, extending over 11°. The p. with three nuclei.
 2. The p. split up into three portions.
 3. Spots at the end of the stream increased in area.
 4. The p. fewer.
 5. Stream thinned out.
- Sept. GROUP 190. *Long.* 53°. *Lat.* 13° N.
 26- On the 26th, a small penumbral spot 23° E. of centre, attaining its
 Oct. greatest dimensions with major axis 35" on the 28th. It showed
 3. some little change, being semi-circular, on the 27th, afterwards more normal, decreasing rapidly after the 30th. A few outliers were seen on the first two days and again on October 2 and 3.

- Sept. GROUP 191. *Long.* 28° to 19° . *Lat.* 13° to 17° S.
26. A few very small straggling spots, 34° to 39° distant from E. limb.
 27. Two much increased, major axis of each about $30''$.
 28. Immense increase in 20 hrs.; a very large spot p. with divided nucleus, several more closely f., altogether a mass of irregular spots.
 29. Leader with nucleus entire, indented, the f. more elongated, length of the whole $2' 15''$.
 30. Nearly central, leader more drawn out, forked in front, the f. separating from it.

- Oct.
1. More small outliers. Strong reversal of C. line over N. point of nucleus and several parts of the f. spots.
 2. Nucleus very large, expanding at the rear with an excrescence to the S. becoming detached; f. spots more intersected.
 3. Nucleus less fimbriated, excrescence severed; much penumbra at the rear; f. spots decreasing.
 4. Bridged, the f. consisting chiefly of penumbra.
 5. Penumbra nearly equal on both sides, but irregular.

- Sept. GROUP 192. *Long.* 18° . *Lat.* 11° S.
- 26-
Oct. } A small penumbral spot f. Group 191, which showed no increase,
3. } becoming more circular and nebulous until it disappeared.

- Sept. GROUP 193. *Long.* 351° to 341° . *Lat.* 10° to 18° N.
28. Some small spots f., Group 189, widely separated in latitude.
 29. More in number; a swarm.
 30. Fewer, with a little wispy penumbra.
- Oct.
1. Larger spots apparently in course of formation.
 2. A stream, components all small, but some with a little penumbra, chiefly confined to the N.; dots intermixed, very much resembling Group 189.
 3. Spots rather more separated and altered in position.
 4. Further separation and extension northwards, in form almost a zigzag.
 7. Much thinned out.
 9. A few, probably the most f., near W. limb at 2.30. It did not return.

- Sept. GROUP 194. *Long.* 305° to 300° . *Lat.* 18° to 21° N.
30. An irregular spot near E. limb.
- Oct.
1. Many small nuclei.
 2. One spot, major axis $45''$, nucleus divided, a fragmentary one to the S.
 3. More normal, many fragmentary spots adjacent. (A small spot, only observed on this date, half-way between this group and 193.)
 4. Penumbra wanting on the f. side.
 5. Very compound, parallel to equator, more outliers.
 7. Main spot divided, more penumbra f., changing rapidly in small details.
 8. Increasing to the N., several portions partially re-united.
 9. Two distinct spots N. and S. of each other, major axes $45''$ and $30'$, only small outliers f.
 10. Reduced in area.
 11. Much foreshortened.
 12. One spot near limb, much decreased.

Oct. GROUP 195. *Long.* 308° to 305°. *Lat.* 2° S.

- 7-11. A small but complicated train with many little dark nuclei, some of them forming a V in shape. It rapidly decreased, the smaller spots soon vanishing and leaving only a very insignificant one near W. limb on the 11th.

Oct. GROUP 196. *Long.* 230°. *Lat.* 16° S.

- 12-15. A few very small spots not far from the central meridian, one f. in long. 208°, lat. 18° S. On the 15th, one just perceptible.

Oct. GROUP 197. *Long.* 157°. *Lat.* 15° N.

- 12-20. A little spot not far from E. limb; small ones f. on the 16th. It did not show much increase, the major axis being only about 30'' when nearly central; decreasing on the 19th. On the 20th, only one spot remained.

Oct. GROUP 198. *Long.* 120°. *Lat.* 15° S.

- 15-18. Two or three small spots at some distance from E. limb on the 15th. They soon decreased.

Oct. GROUP 199. *Long.* . *Lat.* 15° N.

18. One very small spot in the eastern hemisphere.

Oct. GROUP 200. *Long.* 75° to 67°. *Lat.* 12° to 16° N.

19. A cluster of very small spots near E. limb.
20. Immense increase, two compound spots f. each other, dots between.
22. More normal, but nuclei divided, sputterings between.
23. Both nearly equal in area.
24. Nearly central. The p. the larger and most normal, with jagged nucleus, major axis 1'. The f. with a portion reversed. Outliers many and scattered.
25. The p. with nucleus bridged and curved; the f. decreasing.
26. The p. dwindling, the f. more split up.
27. Many more spots f. arranged in curves.
28. The f. more dispersed and decreasing in area.
29. Fewer outliers.
30. Close to W. limb at 11.6.

Oct. GROUP 200A. *Long.* 64°. *Lat.* 17° S.

20. A tiny spot at some distance from E. limb.

Oct. GROUP 200B. *Long.* 88°. *Lat.* 10° S.

- 23-25. Two faint spots, on the 25th, a little pair.

Oct. GROUP 201. *Long.* 28° to 24°. *Lat.* 8° to 14° N.

22. A loose cluster at a little distance from E. limb. A return of Group 187.
23. Spots in two sets, N. and S. of each other, with a little penumbra.
24. More scattered and numerous, but smaller.
25. Altered in position.
26. Several, with more penumbra, a nebulous patch about 15° f.
27. The two sets farther apart in Lat.; one to the S. a regular spot, major axis about 35''.
28. N. spots more concentrated. The one to the S. with barred nucleus, dots in the neighbourhood.
29. N. spots disappearing. The S. split in two.
30. Decreasing. N. spots almost gone.

Nov.

1. S. spot fragmentary.
2. Near W. limb.

- Oct. GROUP 202. *Long.* 28° to 25° . *Lat.* 14° to 16° S.
 22. A compound spot near E. limb, two small ones p.; a return of Group 191.
 23. Dividing.
 24. In two portions.
 25. Both with divided nuclei.
 26. The p. part more normal, the f. with sputterings to the N.
 27. The nucleus of p. large and dense.
 28. Major axis of p. $40''$. The f. decreasing.
 29. The f. still waning.
 30. The p. with a small nucleus detached. More outliers f.
- Nov.
 1. Almost solitary.
 2. Near limb.
- Oct. GROUP 203. *Long.* 350° to 1° . *Lat.* 15° to 18° N.
 23— When near E. limb an irregular spot, afterwards more in number,
 Nov. in two sets, four with penumbra, the leader larger than the rest.
 3. When central, normal, major axis $40''$. On the 30th, nucleus bridged. The f. set, which also at first contained no larger spot, decreased in area but increased in number, many small spots and dots following in a curve and spreading over a wide area. (A return of Group 193.)
- Oct. GROUP 204. *Long.* 358° . *Lat.* 3° S.
 24—25. A tiny pair at some distance from E. limb, on the 25th, single.
- Oct. GROUP 205. *Long.* 328° to 318° . *Lat.* 7° to 12° N.
 29. Some small spots in two sets, about three days E. of centre.
 30. A stream, the first and last spot the largest.
- Nov.
 1. Great increase, more penumbral spots and many small nuclei.
 2. Further increase, stream double and wider at the extremity, the larger spot one-sided.
 3. Expanding at both ends, giving a singular appearance.
 5. Spots again in two sets, the p. more confluent.
 6. Near limb, spots apparently fewer and more normal. (The group did not return.)
- Oct. GROUP 206. *Long.* 294° to 284° . *Lat.* 8° to 11° N.
 29— Some irregular spots near E. limb. On November 1, a normal
 Nov. leading spot, with small ones and dots f. in a zigzag, area 930
 11. square seconds. One of the f. spots showed some increase, but all gradually declined, very few being observed when near W. limb. On November 5 the nucleus of the leader was large and dense, becoming afterwards more irregular.
- Nov. GROUP 207. *Long.* 270° to 264° . *Lat.* 11° S.
 1—8. A very small spot near E. limb on the 1st. On the 5th, a stream chiefly composed of dots, the f. in a zigzag. On the 8th, a pair
- Nov. GROUP 208. *Long.* $^{\circ}$. *Lat.* $^{\circ}$ S.
 2. An insignificant spot, nearly half-way between 205 and 206.
- Nov. GROUP 209. *Long.* 139° . *Lat.* 16° N.
 11—19. A wide pair of small spots, not seen on the 12th, but observed at Greenwich on that date. On the 13th, one larger spot and a few outliers. Mr. Townsend observed a distortion of the C. line between it and one of the smaller ones. After being invisible on the 16th, 17th, and 18th, he again caught sight of it on the 19th.
- Nov. GROUP 210. *Long.* 92° . *Lat.* 5° S.
 13—24. A considerable but irregular spot not far from E. limb. Mr. Townsend found the C line distorted over the faculæ between it and a tiny spot p. on the 13th. It afterwards became normal, but on and after the 18th was for a time divided into two nearly equal parts. Until nearly the end of its course it was accompanied by small spots on the f. side.

- Nov. GROUP 211. *Long.* 78°. *Lat.* 10° N.
 14. Two small spots not far from E. limb (positions of Group 200).
 22. They showed a trifling increase on the 16th and were more in number.
 On the 22nd, in two sets with 4° difference in longitude.
- Nov. GROUP 212. *Long.* 73°. *Lat.* 3° S.
 14-26. A normal spot, near E. limb on the 14th, with a few small outliers.
 Major axis 40" on the 22nd. Little change took place except
 signs of disruption in the nucleus from the 18th to the 23rd.
- Nov. GROUP 212A. *Long.* 121°. *Lat.* 12° S.
 16. A few very small spots in the western hemisphere.
- Nov. GROUP 212B. *Long.* 147°. *Lat.* 18° S.
 16. One very small spot near the central meridian.
- Nov. GROUP 212C. *Long.* 72°. *Lat.* 19° S.
 18-20. A very small spot s. p. Group 212. It had increased a little on the
 20th.
- Nov. GROUP 213. *Long.* 24°. *Lat.* 15° S.
 18-27. A penumbral spot in nearly the same position as 202. Little change
 took place. In major axis it hardly exceeded 30".
- Nov. GROUP 214. *Long.* 2°. *Lat.* 19° N.
 20-27. Another penumbral spot smaller than 213. A return of 203. When
 near W. limb decreasing. Faculæ on the 22nd as far as 30° N.
 f., and still numerous on the 23rd.
- Nov. GROUP 215. *Long.* 333°. *Lat.* 9° N.
 22-27. A little irregular spot near E. limb on the 22nd. On the 26th and
 27th, dots f.
- Nov. GROUP 216. *Long.* 297°. *Lat.* 12° N.
 24- A small penumbral spot. On the 26th and 27th, larger, with a portion
 Dec. detached. On December 1st, entire, normal. Major axis 35",
 4. showing signs of disruption afterwards.
- Dec. GROUP 217. *Long.* 302° to 298°. *Lat.* 12° to 14° S.
 2-4. Two small irregular spots with dots between them. On the 3rd, the
 p. much larger, splitting in two. It must have disappeared
 rapidly.
- Dec. GROUP 218. *Long.* 266°. *Lat.* 3° N.
 2-8. A few very small spots in two sets. On the 3rd, much increased,
 with miniature streams of small nuclei. On the 4th, hardly more
 than one spot, penumbra on the p. side.
- Dec. GROUP 219. *Long.* 184° to 174°. *Lat.* 6° S.
 6-13. Two little spots some distance apart, a smaller one 6° s.f. (Pre-
 ceded by a very small spot on the 3rd, not observed afterwards.)
 They varied a little in number, when last observed one only
 remained with a little penumbra.
- Dec. GROUP 220. *Long.* 161° to 151°. *Lat.* 14° to 16° S.
 6-12. Some irregular little spots f. each other. widely separated in
 longitude.
- Dec. GROUP 221. *Long.* 137° to 132°. *Lat.* 16° to 17° S.
 6. A small irregular spot followed by another on the 8th.
 5. On the 10th, the p. was in fragments, the f. larger and crescented,
 with small nuclei; both soon dwindled and became fragmentary.
 One tiny spot alone remained on the 15th.
- Dec. GROUP 222. *Long.* 144°. *Lat.* 12° S.
 6-17. An irregular penumbral spot, near E. limb on the 6th, with a few
 outliers following, which were of short duration. On the 10th,
 the major axis amounted to nearly 45". It became circular, and
 finally normal.

Dec. GROUP 223. *Long.* 126° . *Lat.* 23° S.

- 8-17. An insignificant spot f. 221. On the 15th, with two tiny companions. It did not exceed $15''$ in major axis, and rapidly dwindled.

Dec. GROUP 224. *Long.* 109° . *Lat.* 22° S.

- 8-17. Another small spot with slight penumbra, nearly equal in area to 223. On the 13th it broke up and became a miniature stream, finally subdividing, with nuclear spots widely separated.

Dec. GROUP 225. *Long.* 127° to 114° . *Lat.* 16° to 20° N.

- 7-19. A train with three principal spots, the leader near E. limb on the 7th, it was throughout larger than the rest, major axis $40''$ on the 10th, and two nuclei on the 11th. The f. spots were very irregular, and rapidly decreased after the 13th, the leader alone surviving to reach the W. limb.

Dec. GROUP 226. *Long.* 120° to 114° . *Lat.* 3° to 6° N.

- 12-19. A sudden outburst, not observed at 3.15 on the 11th. It somewhat resembled Group 225 in having a leading spot (major axis $45''$ on the 13th) followed by smaller ones, the last larger than the rest, which rapidly died out.

Dec. GROUP 227. *Long.* 70° to 64° . *Lat.* 10° to 11° N.

- 13-19. An insignificant spot at some distance from E. limb. On the 14th, two little pairs. Single on the 19th, and very small.

Dec. GROUP 228. *Long.* about 75° ? *Lat.* near equator.

- 15-16. A faint little pair s. p. 227.

Dec. GROUP 229. *Long.* 16° . *Lat.* 16° N.

- 16-23. A penumbral spot near E. limb on the 16th. On the 19th, nearly normal; on the 21st, nucleus cloven, major axis nearly $45''$.

Dec. GROUP 230. *Long.* 29° . *Lat.* 13° S.

- 19-23. At first a very small spot; by the 19th it had immensely increased, and was followed by some smaller ones. On the 21st, splitting in twain, major axis $45''$, the f. very fragmentary. On the 23rd, entire, nucleus cloven, the f. nearly gone. Cloudy skies prevented further observations, also of Groups 229 and 231.

Dec. GROUP 231. *Long.* 12° . *Lat.* 11° S.

- 19-23. Two spots some distance apart, the most f. nearly normal. On the 21st the p. was much reduced, the f. broken up into fragments. On the 23rd, the f. more normal with three nuclei.

Dec. GROUP 232. *Long.* 320° . *Lat.* 11° S.

- 21-31. A large spot, with three nuclei, at some distance from E. limb, major axis about $50''$. On the 23rd, portions apparently detached on the f. side. When seen on the 29th it was solitary, major axis $1'$, the nucleus bridged and irregular. Little change had taken place on the 31st.

Dec. GROUP 233. *Long.* 307° to 302° . *Lat.* 11° to 13° S.

- 21-31. Several penumbral spots f. 232. On the 23rd, three principal spots, the two f. the largest. On the 29th, the p. larger, nucleus jagged, the f. partially united with the penumbra on the f. side, and very compound; dots f. On the 30th, the p. normal, the f. breaking up.

Dec. GROUP 234. *Long.* 237° to 228° . *Lat.* 12° N.

- 29-31. A few spots widely separated, in two sets, the last with a leader, normal, major axis $45''$, and 35° E. of centre, the remainder all small with slight penumbra. The earlier history of this group, owing to cloudy weather, was not recorded.



GROUP LIX.

March 17. 8.20. A.M.

3rd O.G. Power 70.

March 19 8 A.M.

March 21 11.

March 22 11.30.

By Projection Sun's image 25th diam)

GROUP. LXXXIII.

April. 20. 10.30.

J de M. Pereira. del.

April. 24. 10.30.

J de M. Pereira. del.
By Projection Suns image 25th diam)

GROUP. CIII.

May. 27. 9.A.M.

J. Wykes. del.

May. 29 9.A.M. (Direct vision) 4th 0 G. Power. 90

J Wykes. del.

GROUP CXVII.



June 8. 9. A.M



June 10. 12



June 11. 10.

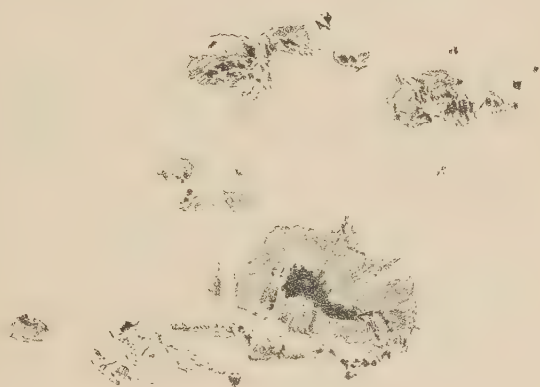


June 13. 9

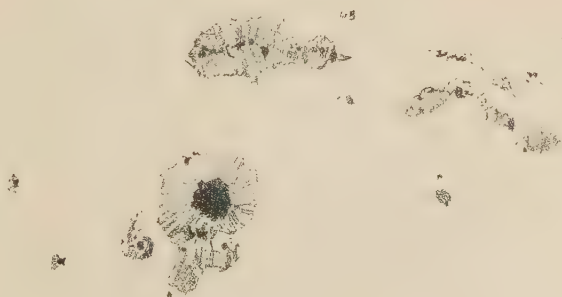
GROUP CXX.



June 15.8.A.M



June 16.8.A.M



June 19 8 A M

E. B. del.

Tauby & Price lith

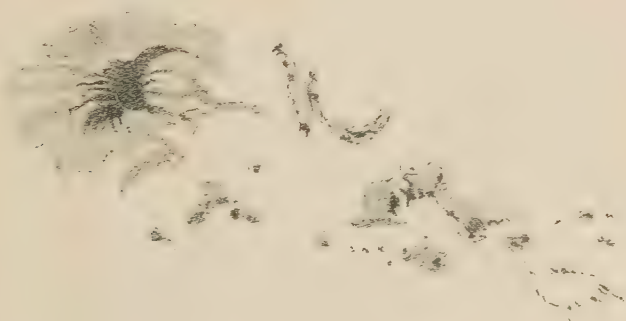
GROUP CL.



Aug. 3.8 A.M.

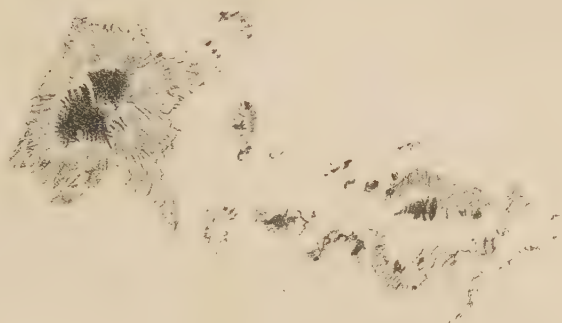


Aug. 3.8 A.M.



Aug. 3.8 A.M.

GROUP CL Continued



Aug. 9.10.24.

JdeM.Pereira del



Aug. 11.8.A.M.

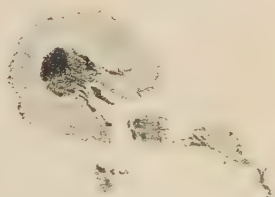
EB del

GROUP CLVIII.



Aug. 18.5.40.P.M.

EB del



Aug. 19.7.43.A.M.

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